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The OIL AND GAS JOURNAL

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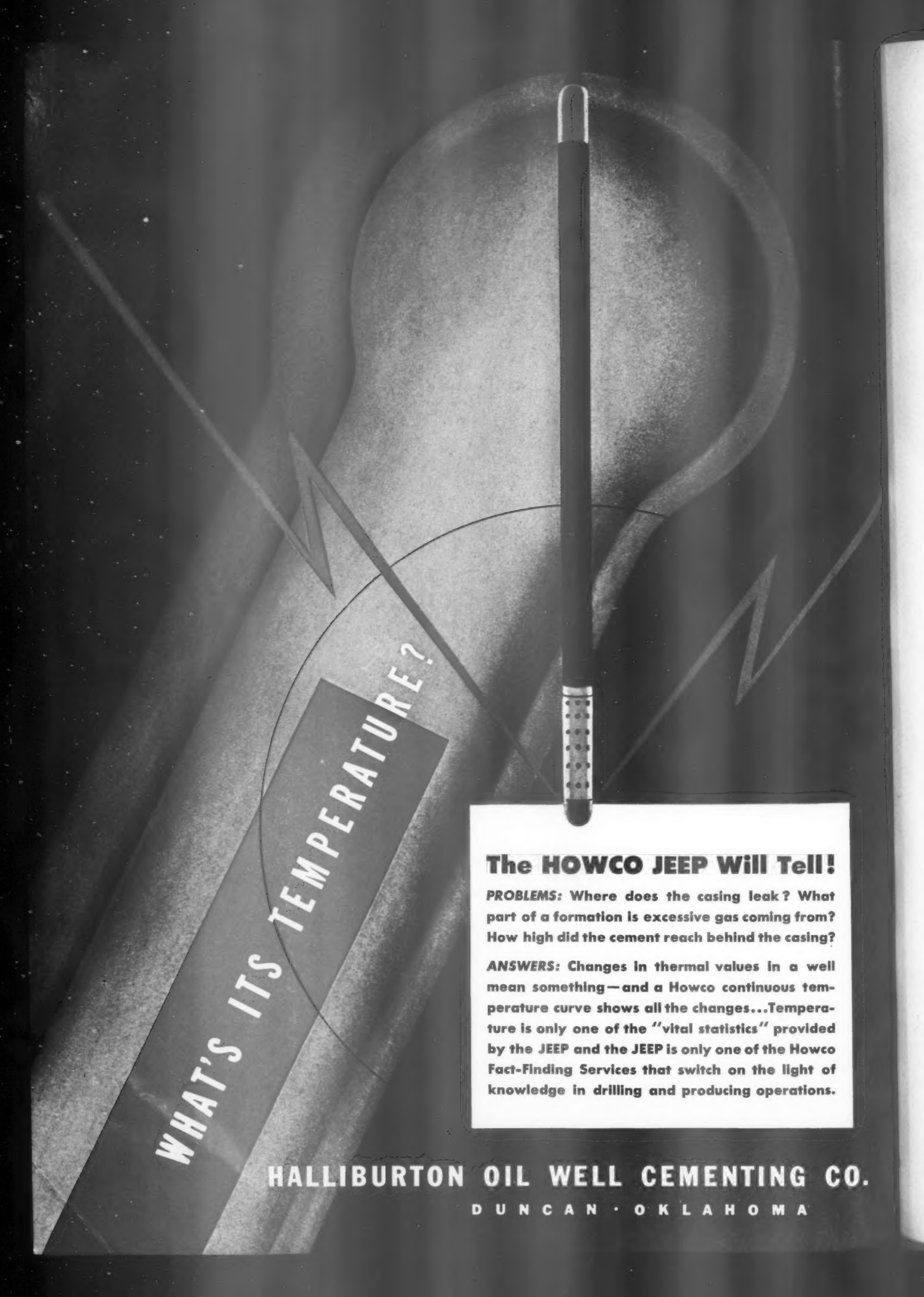

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Table of Contents

NEWS DEVELOPMENTS

Facilities Needed for Processing Sour Crude 26
Government Ownership May Become Part of World Oil Policy 28
First Commercial TCC Unit Goes on Stream 30
Vinson Asks More Time for Study of New Price Data 32
Gasoline Coupons Cut 25 Per Cent in Western Districts 32
Labor Shortage and Rising Drilling Rate Interest Contractors 34
Federal Order Digest 36
Bomber Crews Visit 30 Aviation Plants 36
Deaths 41

Trends 25
This Week 29
Editorial 33
Refining News 81
Pipe-Line News 84
Natural-Gas News 86

ENGINEERING-OPERATING

Refining West Texas Crudes 43
Horizontal Drilling in Pennsylvania Field 49
Front Lines in Refining 52
Oil Zones of the United States 52B
Reasons and Methods for Perforating Tubing 53
Oil-Well Pumping Practices—No. 15 60
Floating Scraper Used on WEP Lines 64
Cracking Technology—No. 6 67

Operating Ideas 56
Book Review 69
Questions on Technology 70
Eng. Fundamentals 77

EXPLORATION AND DRILLING

Week's Highlights 89
Completions in All Fields 89
Daily Average Production for Week 90
Completions by Areas Start on Page 90
Wildcats and Discoveries 107

ADDITIONAL FEATURES

Crude Prices 105
Drilling Contractors 108
Personals 110
Market Developments 114
Refinery Prices 115
Equipment Progress 116
Classified Advertising 117
Calendar of Events 120
Journalisms 120
Advertisers' Index 120

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the OIL AND GAS JOURNAL

Trends

Crude-Oil Production By States — Page 90

CRUDE-OIL STOCKS *234,643,000 bbl. as of Oct. 2—up 665,000 bbl. One year ago 241,179,000.

GASOLINE STOCKS 70,128,000 bbl. as of Oct. 2—up 104,000 bbl. One year ago 78,080,000 bbl.

RESIDUAL FUEL-OIL STOCK 66,407,000 bbl. as of Oct. 2—down 1,238,000. One year ago 79,303,000.

GAS OIL AND DISTILLATES 41,280,000 bbl. as of Oct. 2—up 952,000 bbl. One year ago 45,727,000.

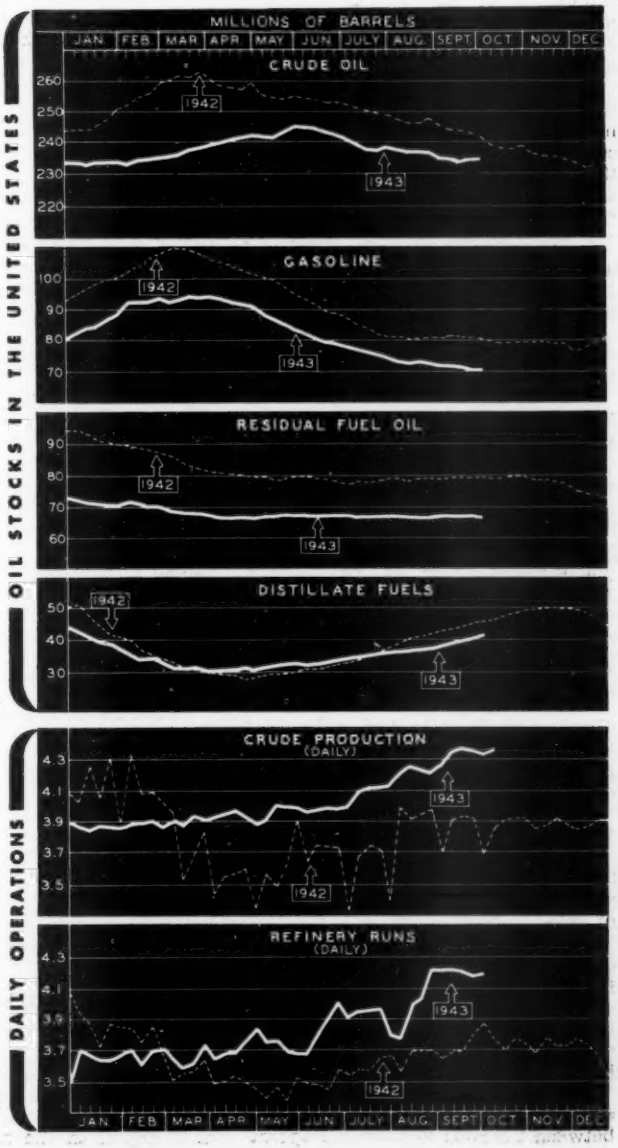
CRUDE PRODUCTION 4,389,970 bbl. daily average—up 65,015 bbl. One year ago 3,869,545.

REFINERY RUNS 4,159,000 bbl. daily week ended Oct. 2—up 3,000 bbl. One year ago 3,902,000.
*Last week revised to 233,978,000 bbl.

THE part that oil supplies outside the United States can play in the Allied war effort is receiving more and more consideration from operators and government agencies. The estimated daily average crude-oil production of countries which have exportable surpluses available to the Allies the first half of this year, in thousands of barrels, was: Mexico, 88.4; Colombia, 11.6; Peru, 37.3; Trinidad, 71.8; Venezuela, 400.5; Bahrein Island, 22.1; Iran, 210; Iraq, 40; Egypt, 21; Saudi Arabia, 16.6. The total was 919,300 bbl. daily. Since the close of the half-year there have been increases in several countries, including 250,000 bbl. daily in Venezuela, 40,000 bbl. in Iran and 30,000 bbl. in Colombia. The 10 countries currently produce around 1,250,000 bbl. daily.

IT is agreed that Venezuela's production could be increased to around 900,000 bbl. daily and Colombia's production could be stepped up to its previous peak output of approximately 85,000 bbl. daily. Mexico's production, now estimated at 100,000 bbl. daily can be expanded if shipping facilities are provided. These investigations indicate that Western Hemisphere output outside the United States could be expanded 300,000 to 350,000 bbl. daily over present production, assuming that tanker capacity can be made available before the end of the year.

IN the Eastern Hemisphere the lack of refining facilities is a stop on what can be done in the further extension of petroleum operations in that area. Iraq is capable of producing 85,000 bbl. of crude oil and delivering to Tripoli and Haifa, the pipe-line terminals on the Mediterranean. It has not been possible to operate the Tripoli leg at capacity because there has been no place to go with all the crude. Most of the crude was formerly refined in France. The crude is sour as is most of the crude oil produced in the Middle East and requires special processing facilities. Right now, as explained elsewhere in this issue, interest centers in a major refinery project for the new production that is available in the Persian Gulf area. It is said that production in excess of 100,000 bbl. daily could be made available from Saudi Arabia, Bahrein Island and Kuwait by the time that refining facilities of that capacity can be installed. It is pointed out that all of the projects now under consideration for the Eastern Hemisphere will require a year or more to complete. This means that the increased petroleum needs of the Allies will continue to be largely supplied from the Western Hemisphere through 1944.



Facilities for Processing Sour Crude Needed to Meet Refinery Program

WASHINGTON, D. C.—A steady rise of refinery operations to a projected average of 4,443,000 bbl. of daily runs to stills during the final quarter next year is forecast in a report submitted here last week before the Petroleum Industry War Council. The report on refinery availability and an appraisal of capacity for running Permian basin high-sulfur crude oil was compiled by the economics committee of the PIWC, and replaced the customary over-all statistical review and forecast on all phases of petroleum industry operations.

Several pertinent conclusions reached by the PIWC economics committee all point to the necessity for conditioning plants and facilities for the processing of greater volumes of sulfur crude oil. Among pertinent findings are:

1. Substantial capacity must be constructed or existing facilities modified to handle West Texas sulfur-contaminated crude oil.

2. Practically all of the available capacity in District 2 must be utilized to fulfill the long-term program.

3. Total net additions to potential-input rates in all districts results in a capacity availability of approximately 260,000 bbl. per day over and above the levels of crude runs to stills as programmed by the PAW during the fourth quarter of next year.

4. Runs of sulfur crude to District 2 refineries will rise to 159,000 bbl. daily in the third quarter of 1944, if the region is to keep total throughput up to program levels.

5. District 1 refiners may be required to run 154,000 and 158,000 bbl. of sulfur crude daily during the third and fourth quarters next year compared to a current rate of 95,000 bbl. daily.

6. District 3 refiners are expected to use full capacity of 284,000 bbl. daily in processing high-sulfur crudes beginning in the fourth quarter of this year and continuing throughout all of 1944.

7. Provisions must be made to handle 3,000 bbl. daily of additional sulfur crude in the second quarter next year, 84,000 bbl. in the third quarter and 100,000 bbl. in the fourth quarter, if the industry's manufacturing program is fulfilled.

Data in the report show that despite a margin of 260,000 bbl. daily between the runs to stills and operating capacity forecast by the fourth quarter of next year, there remains a deficiency of facilities for handling sulfur crude. It is evident from data in the report that additional capacity for processing sulfur crudes must be installed or existing facilities conditioned for refining this type of crude which represents the only appreciably expandable supply.

Recommendation was made that the PIWC refinery committees determine the amounts of alloy steel required to handle the increased quantities of high-sulfur crude and that the necessary steps be taken through PAW to secure these allocations from the War Production Board.

Pertinent sections of the report follow:

While each district has some reasonably efficient spare refining capacity above the programmed runs, which would be of value if additional crude supplies could be secured, the per cent used during the fourth quarter of 1944 will average in the neighborhood of 95 per cent which is well above the average for any prewar period. The precise figures as to excess capacity by districts by quarters may be summarized as follows:

EXCESS OF INDICATED REFINING CAPACITY OVER PROGRAMMED RUNS*
(Daily averages in barrels)

	Fourth quarter 1943	First quarter 1944	Second quarter 1944	Third quarter 1944	Fourth quarter 1944
District 1	62,000	62,000	62,000	47,000	47,000
District 2	169,000	202,000	169,000	130,000	110,000
District 3	59,900	95,400	95,400	72,400	47,400
District 4	17,000	26,500	23,500	18,500	21,500
District 5	19,000	17,000	23,000	24,000	30,000
Total United States	326,900	402,900	372,900	291,900	258,900

*Does not include skimming capacity.

Total efficient refining capacity in this country, operating on a basis of making maximum war products, will increase from about 4,553,500 bbl. in September 1943 to 4,701,900 bbl. by the end of 1944. This refining capacity would be substantially higher under peacetime conditions where it was not necessary to take so many special steps to maximize the production of war products.

Refinery Availability

This is the second of a series of three availability reports which began with this committee's survey of crude-oil producibility on which it reported at the council's July meeting. It is hoped, in the near future, perhaps at the November session, to report on the general subject of minimum working stock requirements and from those figures to develop the current and future availability of the crude oil and products now in storage.

Considered as related to the general subject of refinery availability were such subjects as (1) the current rate of runs to stills of West Texas-New Mexico high-sulfur crudes and the additional capacity currently available for the processing of this type of oil, as well as the probable potential capacity for utilization of such oil during the remainder of 1943 and during 1944; and (2) the developments in the residual fuel-oil situation, particularly as it affects the District 1 inventory position and the trend of yields of this product in Districts 1, 2 and 3.

For the purpose of collecting the new type of capacity figures necessary under today's method of operation, the following definition was developed and used in this survey: That the capacity of a refinery, at any particular time, is the amount of new crude that can be charged daily, from the then current crude stream, related to the type and amount of other equipment available, including cracking facilities, fractionation, etc., as determined by the following limitations: (a) Maximizing the production of essential war products; (b) maximizing the production of motor gasoline, and (c) minimizing residual fuel-oil production.

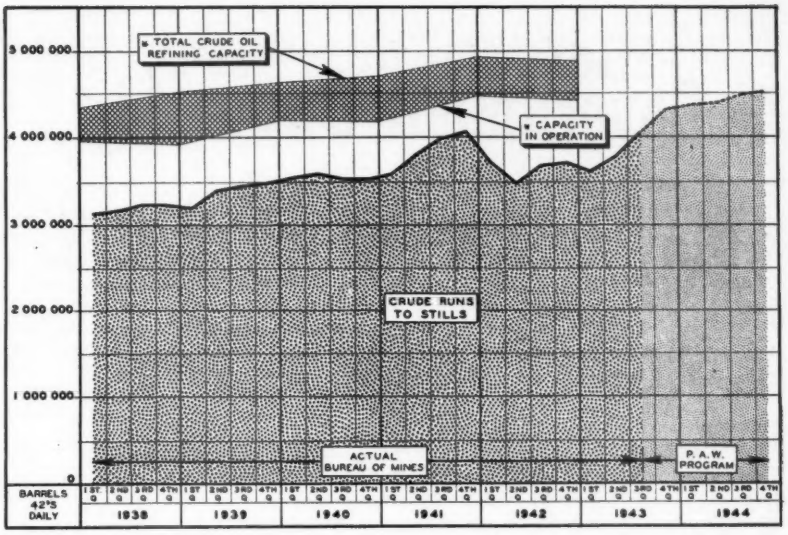
It was recognized that to some extent the statements in (b) and (c) above might be conflicting but the intent was to have purely topping capacity included only when it usefully ties into a refinery operation which furthers the war effort, such for example, as the production of asphalt from certain crudes. Purely topping

capacity not now employed is not included in these figures as those facilities would produce low-octane gasoline and excess quantities of heavy fuel, the production of which is not justified under present conditions of shortage of crude and oversupply of residual fuel.

Any substantial change in product specifications, such as that covered in the recent discussions looking towards the lowering of the boiling points of gasolines for military purposes would alter these crude-input rates as would important revisions of the present list of designated essential war products. Since the great bulk of all light ends are even now going into military gasolines such action would necessarily further raise the average boiling point of commercial gasolines. The figures for District 2 cited in the tables herewith were not compiled on the basis of the definition shown earlier but were taken from a compilation recently made by a subcommittee of the refining committee of that district, on the basis of "reasonably efficient capacity." In view of the fact that fulfillment of the long-term program requires the utilization of practically all of the unused available capacity in District 2, it is important that figures based upon the definition referred to, be compiled for that district at an early date.

District 5 Unchanged

The figures received from District 5 are in the form of a report dated February 18, 1943, and it was stated that "there has been no material change in refinery capacity since." Table 1 shows a tabulation of present daily crude-oil input as compared with estimated September runs, and the availability of capacity, as defined, above the September rate.



*Bureau of Mines refining capacity and crude runs to stills from 1938 through 1942 and the first part of 1943. Data for the last half of this year and for all of 1944 are from the PAW program. *At January 1, per Bureau of Mines*

In Table 2 there are figures indicating the present daily crude-oil input capacity of refineries in the United States as defined and the potential capacity which will be available by quarters beginning with the fourth quarter of the year and for those of 1944 compared with the anticipated refinery runs as indicated in the PAW program section long-term report less estimated runs to asphalt plants. Also shown are the additional refinery capacities available by quarters throughout the period indicated and by districts as well as the country as a whole.

It will be noticed that the District 1 potential input capacity declines in the fourth quarter of this year from the present level. This decline is occasioned by the fact that a refinery in that area, which is about to begin the production of considerably larger quantities of high-octane gasoline

(Continued on page 38)

TABLE 1

Present Daily Crude-Oil Input Capacity of Refineries in the United States; Estimated September Input Rate and Availability of Capacity Above Current Actual Levels, Exclusive of Purely Asphalt Plants

	Present daily crude oil input capacity of refineries (bbl.)	Estimated September daily average crude input* (bbl.)	Per cent operated during September	Capacity availability above September rate (bbl.)
District 1:				
East Coast	696,000	610,300	87.69	85,700
Appalachian	116,000	105,000	90.52	11,000
Total	812,000	715,300	88.09	96,700
District 2	1,331,000	1,133,000	85.12	198,000
District 3:				
Coastal area	1,202,500	1,165,000	96.88	37,500
Inland area	343,000	300,000	87.46	43,000
Total	1,545,500	1,465,000	94.79	80,500
District 4	94,000	80,000	85.11	14,000
District 5	771,000	720,000	92.09	51,000
Total United States	4,553,500	4,113,300	90.36	440,200

*Exclusive of input of purely asphalt plants, except as usefully tied in to the war effort.

Note: In East Coast portion of District 1 there is an additional 22,500 bbl. of daily capacity, under the definition, part of which is currently shut down because of lack of tankage while the remainder is not usable on account of the present residual fuel-oil situation on the Atlantic seaboard.

TABLE 2

Present Daily Crude-Oil Input of Refineries in the United States and Potential Capacity

	Present dly. crude oil input capacity (bbl.)	Fourth quarter 1944 (bbl.)
District 1:		
East Coast portion	696,000	671,000
Appalachian portion	116,000	116,000
Total, end of period	812,000	787,000
Estimated runs	715,300	740,000
Additional capacity available	96,700	47,000
District 2:		
Total, end of period	1,331,000	1,370,000
Estimated runs	1,133,000	1,260,000
Additional capacity available	198,000	110,000
District 3:		
Gulf Coast area	1,202,500	1,325,900
Inland area	343,000	346,500
Total, end of period	1,545,500	1,672,400
Estimated runs	1,465,000	1,625,000
Additional capacity available	80,500	47,400
District 4 entire district:		
Total, end of period	94,000	101,500
Estimated runs	80,000	80,000
Additional capacity available	14,000	21,500
District 5, entire district:		
Total, end of period	771,000	771,000
Estimated runs	720,000	738,000
Additional capacity available	51,000	33,000
Entire country:		
Total, end of period	4,553,500	4,701,900
Estimated runs	4,113,300	4,443,000
Additional capacity available	440,200	258,900

Government Ownership May Become Part of U.S. World Petroleum Policy

by Henry D. Ralph

WASHINGTON, D. C.—World-wide petroleum policies of the United States Government took more tangible form here this week, although many missing bits prevented a full analysis of the complete program. Those in charge of developing a United Nations oil program purposely withheld certain pieces of information essential to making a composite picture for reasons of military security.

Evidence was gleaned from numerous sources, however, to support the conclusion that substantially larger portions of the Allied military requirements will be drawn in the future from South America and the Near East. One report circulated in official circles that the federal Government is negotiating with the California Arabian Standard Oil Co. for a participating interest in the development of resources in Saudi Arabia. There was no confirmation obtainable on this report which would mark the first time that the United States Government owned an operating share in foreign petroleum properties.

Speculation immediately developed that the Government, operating through Petroleum Reserve Corp., might elect to become a direct owner in foreign countries to minimize the danger of expropriation or expulsion in peacetime. Another angle to the broadening world-petroleum picture was appointment of a petroleum attache by the Department of State for assignment to the Near East. Still another report, likewise unconfirmed, was that two high officials of government petroleum bureaus had either departed or would leave shortly for an inspection trip to the Persian Gulf district.

The Petroleum Industry War Council here last week took official notice of the improved outlook for more complete coordination of foreign petroleum supplies under control of the United Nations. A PIWC report stated that an effective basis of cooperation between the armed forces and the PAW is working out a satisfactory world oil program. While the details are not available for publication, the PIWC report went on, the pertinent factors in the world-supply situation are being given increasing consideration. This is reflected in the fact that a larger proportion of petroleum war demands are being currently taken from other than United States sources.

Foreign Operations Coordinated

Foreign operations of American oil companies are more completely coordinated and the foreign operations committee of PAW is given more responsibility by Directive 70 issued here October 12.

Object is to attain more efficient use of materials, equipment and transportation in producing and distributing petroleum products to meet essential needs of the United Nations. Special authorizations to FOC previously contained in Directives 2, 9 and 38 are revoked and more general authority on the same subjects is conferred by Directive 70, which continues in effect Plans 14, 24, 25 and 26 previously approved by PAW and applied by FOC.

The foreign committee is required to utilize refining, terminal and transportation facilities of all companies without regard to ownership to achieve maximum efficiency and reduce cross hauling and transportation waste. Allotment and routing of vessels to carry out FOC plans are subject to control by PAW and the War Shipping Administration. The committee is to arrange sales, exchanges and loans of products to accomplish the objectives, and to make plans for equitable sharing of losses in transit and for differences in costs of handling through joint facilities

The committee is to prepare, subject to PAW approval, schedules of oil requirements of foreign areas, plans for supplying them, and schedules for imports to United States, and is ordered to coordinate its plans with the British overseas supply committee and other appropriate agencies of the United States or Allies. The petroleum supply committee for Latin America becomes subcommittee of FOC. PAW must approve all plans and schedules before they become operative, and retains right of appeal from committee actions.

Petroleum observers here also attached significance to the official visit to this country by two sons of the Arabian king. There is hardly any doubt that petroleum figured prominently in the discussions between representatives of the Arabian king and officials of this country.

James Terry Duce, director of PAW's Foreign Division, is resigning October 15 to return to San Francisco, Calif., as vice president and a director of the California Arabian Standard Oil Co., which owns the concession in Saudi Arabia. The Arabian company is jointly owned by Standard Oil Co. of California and Texas Co.

The concession covering approximately the eastern third of Arabia was originally acquired in the early 1930's by Standard of California. Texas Co. acquired a half interest in later negotiations. Bahrein Petroleum Co., Ltd., and California Texas Oil Co., the marketing concern, are affiliates in the integrated operations stemming from production and refining facilities in the Persian Gulf and on the Arabian mainland. Reports also circulated that one high government official wanted the Petroleum Reserve Corp. to purchase all California Arabian Standard interests in Arabian petroleum properties rather than a participating interest.

Mexico Plans Expansion of Exploratory Operations

Twenty-three Mexican geologists on the staff of Petroleos Mexicanos and several engineers and geologists from the United States, acting in an advisory capacity, last week discussed plans for exploring new prospective oil acreage in Mexico. The group assembled at Mexico City for the conferences at the request of Efrain Buenrostro, general manager of Petroleos Mexicanos.

Among the United States technicians attending was E. DeGolyer, Dallas, Tex., former assistant deputy petroleum administrator and now serving as consultant to the Petroleum Reserve Corp.

Importation of seismographic and drilling equipment from the United States will be sought, Mr. Buenrostro announced at Mexico City.

THIS WEEK

RATIONING—Value of A, B and C coupons cut to 3 gal. in Rocky Mountain and Pacific Coast states, down 25 per cent. . . . ODT policy of maintaining highway transport influenced PAW and OPA in keeping total cut to less than 15 per cent. . . . Motorists received only a few hours' warning of the effective hour of the cut. . . . Growth of military demand to 52 per cent of total supply in the two districts anticipated, now stands at 43 per cent was 24 per cent in 1942. . . .

TRANSPORTATION—Pipe-line movement of oil to East Coast reaches record-breaking rate of 360,000 bbl. daily, up 294,000 bbl. from prewar average. . . . ¶Deliveries into WEP 20-in. products system on Gulf Coast will start this month. . . . ¶Sellers reluctant to deliver crude at Longview, Tex., terminal of WEP 24-in., fearing higher price would minimize benefits. . . . ¶Possibility growing for crude-oil line from Wyoming to Pacific Northwest, originating in Elk Basin field, terminating in Washington or Oregon. . . .

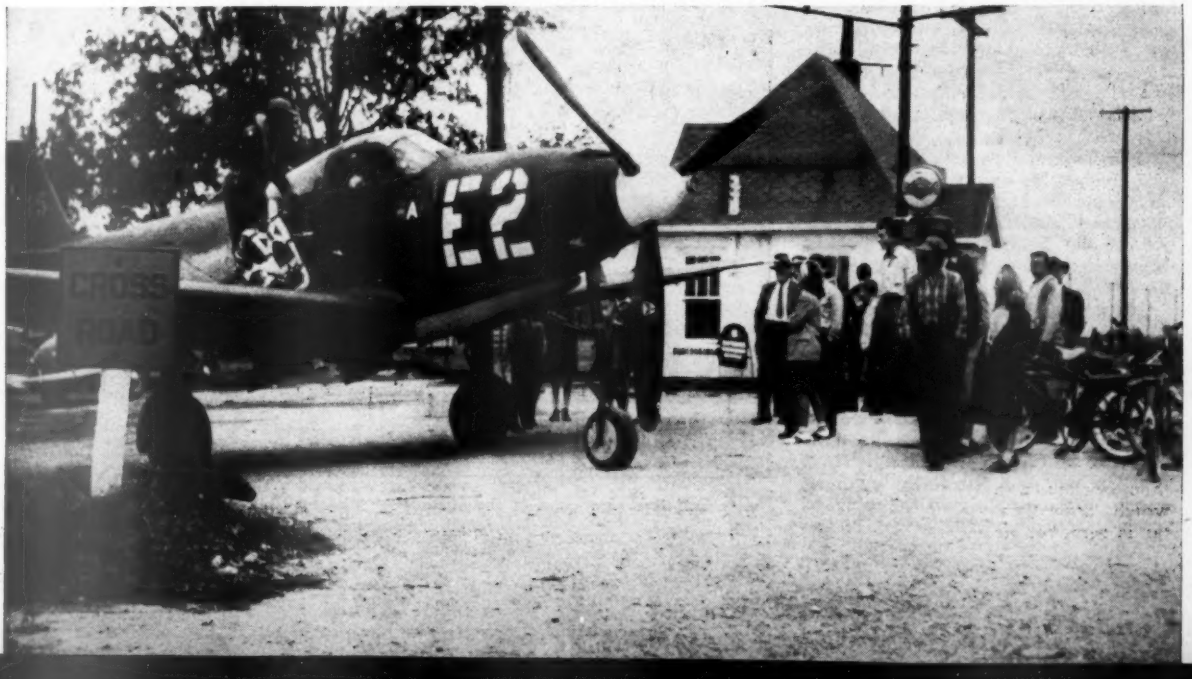
PRODUCTION—Greater authority over spacing and other producing operations assigned PAW director in charge of District 5. . . . ¶Output of 600,000 bbl. daily from West Texas Permian basin forecast by PIWC group in meeting programmed refinery runs. . . . ¶Pipe-line proration reappears in West Texas, applied by Humble Pipe Line Co. in four Ector and Andrew County fields. . . .

REFINING—First commercial TCC unit placed in operation on Gulf Coast, adding to aviation-gasoline manufacturing capacity. . . . ¶Numerous other aviation-fuel plants, possibly 20 to 25, will go on stream between now and December 31. . . . ¶Refinery crude-oil runs of 4,443,000 bbl. daily by fourth quarter next year anticipated by PIWC economics committee. . . . Substantial rise in processing of sulfur-bearing crude oils anticipated in committee report. . . . Emphasis placed on necessity of building new facilities or conditioning existing plants to handle sour crudes. . . .

FOREIGN—Operations of American oil companies in foreign fields more completely coordinated, group assigned more responsibilities in new PAW directive. . . . ¶State Department assigns petroleum attache to Near East countries. . . . ¶Negotiations rumored to be under way between Petroleum Reserve Corp., and California Arabian Standard Oil Co., for acquisition of an interest in the latter company's Arabian concession. . . . ¶Two sons of Arabian king are official guests in this country. . . . ¶Bits of evidence add up to general conviction that much heavier call will be made on Near East supplies. . . .

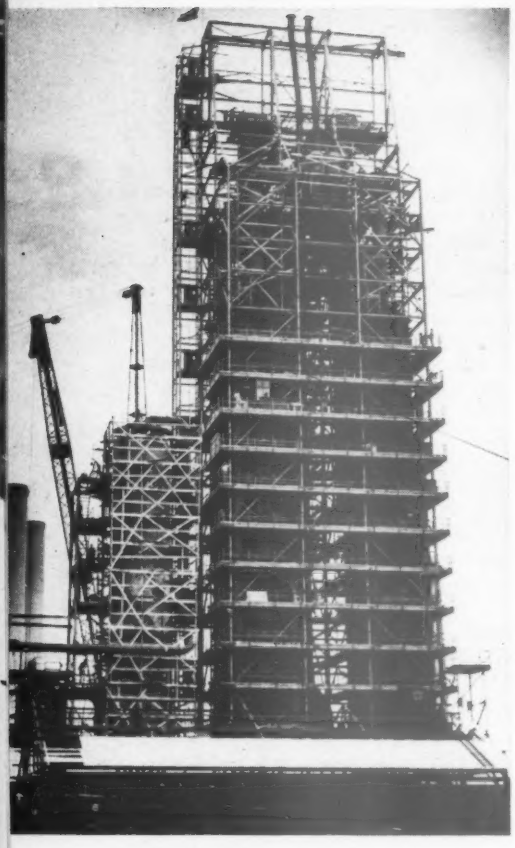
PRICES—Economic Stabilizer Vinson listens to congressional committee's plea for decision on crude-oil price appeal without comment, asks for additional time to study new data. . . . House and Senate tempers rising, appear near point to take legislative action, unless bureaus act in near future. . . . ¶Fate of oil-price legislation is uncertain, because oil-state representatives are in minority. . . . Politics could prove stronger than critical necessity for incentives to spur production. . . .

To label this a preview of things to come may tax the imagination but the call of airplanes at roadside service stations will become so commonplace in the postwar-aviation era as to attract little attention from even the most avid camera fan. The pilot of this P-39 fighter ran out of gas near Detroit recently on a routine flight. He circled until traffic dispersed; made a forced landing, and nonchalantly asked the station attendant for gasoline



First Commercial TCC Unit Goes on Stream, Adding New Aviation-Gasoline Capacity

by J. P. O'Donnell



Front view of the TCC unit in final stages of construction at Magnolia Petroleum Co.'s refinery

THE first commercial-size Thermofor catalytic-cracking unit in the world went on stream at the Beaumont, Tex., refinery of Magnolia Petroleum Co., October 11. This plant, embracing the first two of 29 TCC reactor-kiln units now under construction or contracted for, is participating in the war program through its ability to manufacture aviation-gasoline base stock, products for alkylating into 100-octane blending agents and raw material for synthetic rubber. The butylene fraction from the new unit will be shipped to the Neches Butane Products Co. plant at Port Neches for dehydrogenation into butadiene. Magnolia is one of five companies participating in the operation of the Neches plant, largest in the world for the production of butadiene.

Magnolia's TCC plant, designed and constructed by the Lummus Co., processes a mixture of reduced crude and gas oil totaling approximately 25,000 bbl. daily. The charge is preheated by exchange and then passes to a Lummus heater where the temperature is further increased. It is then flashed in a tar flash tower in which approximately 5,000 bbl. of tar is removed and 20,000 bbl. of gas oil passes overhead through a separately fired vapor superheater in two parallel streams to the two reactors, each of which has a nominal capacity of 10,000 bbl. daily. The reactors can handle any charge from a heavy naphtha to a heavy gas oil.

The gas oil is superheated before it passes to the reaction zone. The reactors operate at a pressure somewhat above atmospheric. Here the vapors from the superheating furnace, entering at the bottom, pass countercurrent to the downflowing catalyst which enters at the top. The catalyst is fed from a hopper constantly replenished with regenerated catalyst from the kiln (see flow chart, Fig. 1).

The reactor is divided into three zones, the upper zone in which cracked vapors are collected, the central zone in which reaction takes place and the lower zone in which the spent catalyst is purged. A series of flues conducts the vapors from the reaction zone to an open area above the catalyst bed where they accumulate before passing to the fractionating tower. The reaction zone is equipped with baffles to promote intimate contact between the vapors and the catalyst. Baffles are also installed in the purge zone located below the oil-inlet line. In this zone the spent catalyst is purged with superheated steam to recover adsorbed oil before the used catalyst is deposited in the conveyor carrying it to the regenerator. The reactors are 60 ft. high and 11 ft. 6 in. in diameter.

After it leaves the reactor, the spent catalyst flows to the base of the elevator from which it is carried by a continuous bucket-type conveyor to the supply hopper for the regenerator. This phase is similar to that of reaction in that the spent catalyst enters at the top of the kiln and passes downward through successive burning and cooling zones where regeneration progresses until the residual carbon is reduced to such a level that the desired catalyst activity can be maintained. The design of the kiln is such that the catalyst is uniformly exposed to the air supplied for burning and thus the carbon is removed from all particles uniformly with the

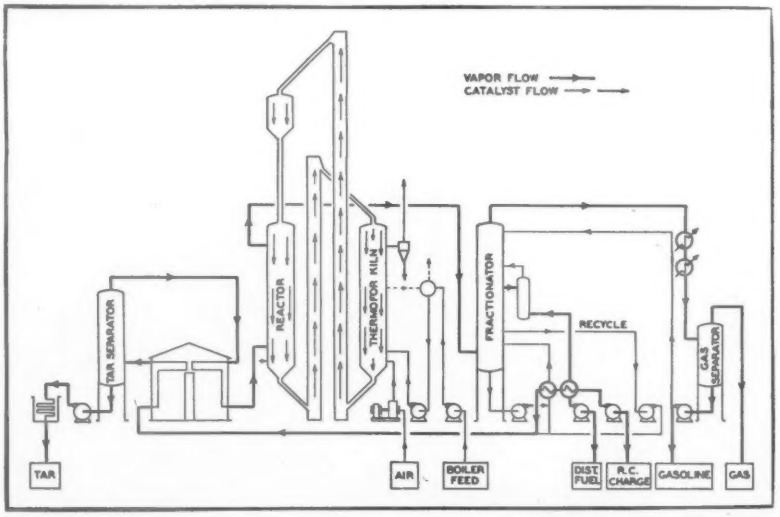


Fig. 1: Simplified flow chart of one of the two duplicate units at Magnolia Petroleum Co.'s refinery, Beaumont, Tex.

result that none is exposed to severe temperature conditions which might cause a degradation of catalyst activity.

The combustion gases are removed from the kiln at various points in a unique manner so that positively uniform flow of air and combustion products through the downward moving catalyst bed is achieved. The combustion gases, after entering the stack, flow upward through an elutriator where a small percentage of regenerated catalyst is recirculated downward to eliminate fines and control the average particle size of the catalyst. The flue gas then passes through cyclone separators where catalyst fines are removed and thence into the atmosphere. The regenerators are 110 ft. high and about 10 ft. square.

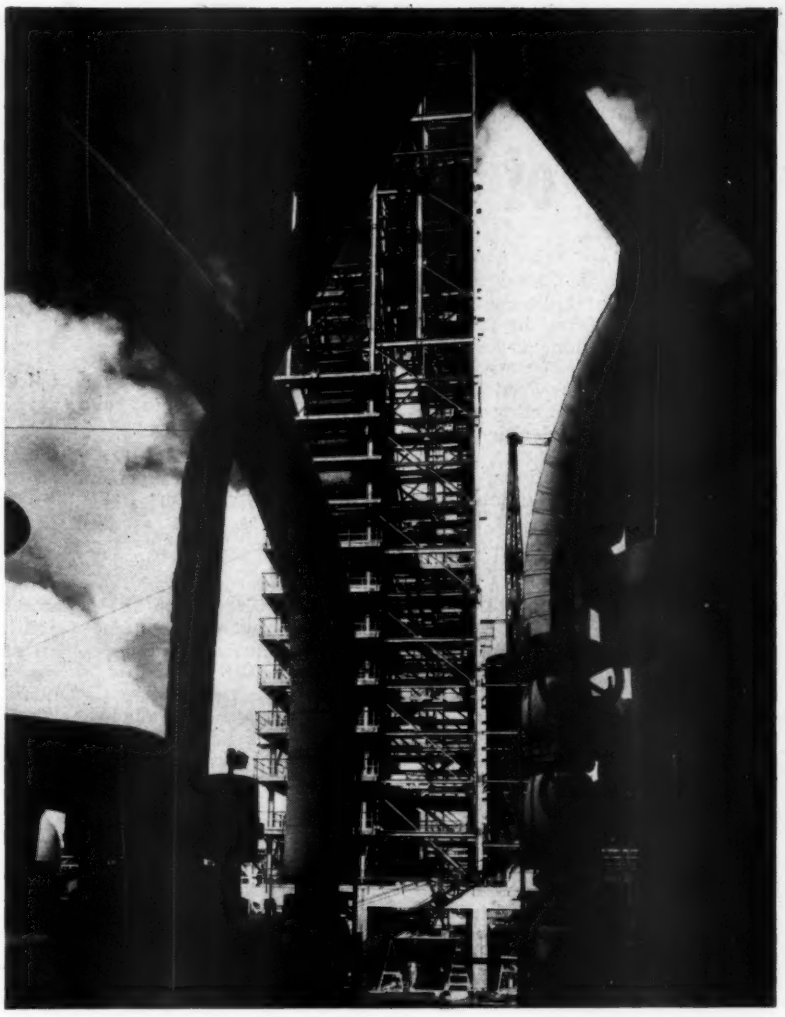
Flow of Catalyst

Movement of the catalyst through both the reactor and regenerator is controlled by valves which regulate its flow from either vessel. At present the Magnolia unit is using the pelleted-clay catalyst which will probably be replaced with the bead synthetic catalyst announced several months ago by Socony-Vacuum Oil Co., Inc., parent company of Magnolia and developer both of the TCC process and the bead catalyst. A plant for the manufacture of the new catalyst is now being constructed by the Lummus Co. and it is expected to be in operation early in 1944. The bead catalyst is very rugged which results in negligible attrition losses and sustained high activity. One fundamental feature is uniform particle size which allows for ideal distribution both in the reactor and kiln and results in better yields, both in volume and quality, than were obtained with the pelleted-clay catalyst.

Since the Magnolia plant will use the pelleted-clay catalyst for the time being, its reactors are equipped with internally mounted baffles to promote catalyst-vapor contact efficiency.

Two features of the kiln or regenerator are of interest. The water used to cool the catalyst is converted to high-pressure steam by heat released from burning coke off the catalyst. This and additional steam generated by heat removed from outgoing oil streams provide 400 lb. steam for use elsewhere in the refinery. A second feature is the small size of the blowers used to drive air for burning coke off the catalyst through the kiln. Blowers with a discharge pressure of 2.5 lb. are sufficient for this purpose. The regenerators are operated at atmospheric pressure.

Cracked vapors from the reactor pass to a bubble tower where the gasoline fraction is separated from No. 2 heating oil and heavy cycle gas-oil bottoms. A side stream of cycle gas oil may also be taken off the tower. The overhead stream is condensed and charged to a debutanizer. The wet gas is further processed for the recovery of butylenes as charging stock for the Neches butadiene plant and the gasoline is processed for aviation gasoline base stock and motor gasoline.



Aviation base stock and charge for alkylate plants are produced in this new TCC unit which went on stream this week

As previously mentioned, Magnolia's plant includes two of 29 reactor-regenerator elements now under construction or contract. Others are being built by Gulf Oil Corp., Pure Oil Co., Continental Oil Co., Crown Central Petroleum Co., Sinclair Refining Co., Ashland Oil & Refining Co., Socony-Vacuum Oil Co., Inc., Lubrite Division; General Petroleum Corp., Richfield Petroleum Corp., Union Oil Corp., Socony-Vacuum Oil Co., Inc., Sun Oil Co., Tide Water Associated Oil Co., and Standard Oil Co. of California.

When the new Magnolia unit went on stream it marked the culmination of more than 5 years research and development activity on the part of Socony-Vacuum directed toward the perfection of a continuous catalytic-cracking process. The process was first conceived when the Thermofor kiln, originally designed to revivify percolation clay, was being perfected. It was obvious that the kiln, based on exhaustive studies of air-clay contact and clay-flow characteristics, offered a method of continuous catalyst regeneration and, therefore, was adaptable to this purpose. A 500-bbl. per day unit was constructed at Paulsboro and has been in operation for more than 30 months.

Original work was directed toward the development of an economical process for the manufacture of high-grade motor gasoline. With the advent of war and the consequent need for increasing aviation-gasoline production for which catalytic cracking is ideally suited, effort was concentrated on perfecting a process that would yield a maximum of war products. The semicommercial and pilot plant results have been outstanding

(Continued on page 41)

Vinson Asks More Time for Study of New Price Data

WASHINGTON, D. C. — A decision on the price of crude petroleum may be expected from the Office of Economic Stabilization very shortly, according to a group of congressmen who called on Director Fred M. Vinson last week, but no inkling was obtained as to what the decision might be.

The OES has been studying the appeal of the Petroleum Administration for War from the refusal of the Office of Price Administration to grant PAW's request for an increase of 35 cents per barrel in the crude-price ceiling.

Meeting with Director Vinson were Representatives Lee of California, Vinson of Georgia, Rees of Kansas, and Bates of Massachusetts. Their conference was the outgrowth of a caucus of representatives from oil-producing states earlier in the week which demanded that the OES increase the crude price or face the threat that Congress would raise the price by special legislation. Several bills to accomplish this are already pending in Congress. The four congressmen reported that Director Vinson listened to their plea without indicating what his decision might be. He stated that he wanted to study some additional recent data before reaching a decision.

Congress has indicated that it is about ready to take the crude-oil price matter in its own hands. Temporarily the issue rests with Fred Vinson, director of OES, who is studying new data.

Director Vinson was also called on last week by a delegation of independent petroleum producers, with the same result.

Meanwhile, two additional committees of Congress have added their endorsement to the recommendation for an increased crude price as a necessary stimulant to additional production.

These were the petroleum subcommittee of the House naval affairs committee, headed by Rep. L. Mendel Rivers of South Carolina; and the special Senate committee investigating the fuel situation in the Middle West, headed by Sen. Bennett Clark of Missouri.

Gasoline Coupons Cut 25 Per Cent in Western Districts

WASHINGTON, D. C.—A 25-per cent reduction in the value of A, B and C gasoline coupons in PAW Districts 4 and 5 became effective at midnight October 11.

A quota of 169,000 bbl. of gasoline for daily civilian consumption was certified by the Petroleum Administration for War to the Office of Price Administration as available for rationed distribution.

Certification of a definite quota for Districts 4 and 5 places the national total of motor fuel available for civilian consumption at 1,160,000 bbl. daily. Quotas were previously established for the final quarter in the eastern part of the country as follows: District 1, 379,000 bbl.; District 2, 467,000 bbl. and District 3, 145,000 bbl. daily.

The reduced coupon value in the two western districts apply in Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Utah, Colorado and Arizona.

Petroleum Administrator Ickes, explaining the reasons for setting a difinite quota in the Rocky Mountain and Pacific Coast states, said that military requirements for gasoline in 1942 represented 23 per cent of the total supply. Currently, the military demands have increased to 43 per cent, and estimates for next year place military requirements at 52 per cent of all available gasoline.

Twenty-Nine Tankers Launched in September

WASHINGTON, D. C. — Twenty-nine new tankers of all classifications were launched by American shipyards in September, the Maritime Commission reported last week. The September launchings represented an increase of seven vessels over August production.

Included in the September launchings were 14 regular tankers, eight emergency-type tankers and seven coastal vessels. In August there were 16 regular tankers and six coastal types launched.

There were 13 Maritime Commission ocean tankers and four coastal types included in the September launchings. One private seagoing tanker, three private coastal types and eight emergency tankers completed the September production record.

Curb on Octane Value Recommended to PIWC

WASHINGTON, D. C.—A recommendation for a reduction in the volatility and octane rating of ordinary motor gasoline was placed before the Petroleum Industry War Council here last week to avert a threatened shortage in tetraethyl lead.

The increase in allowable tetraethyl lead in aviation gasolines, plus the increasing demands for aviation and other military gasolines of high-lead content, have resulted in another threatened shortage of anti-knock fluid as well as of the more volatile constituents which are normally put into ordinary motor gasoline, it was reported by the PIWC economics committee.

"In order to meet the increasing requirements for these products," the committee reported, "it appears necessary that both the volatility and the octane rating of ordinary motor gasoline be somewhat reduced, and it is recommended that revised specifications looking toward this end be promulgated by PAW.

"Natural gasoline supplies," the committee continued, "should be directed to those plants most needing it for war-product production." The necessary saving of lead should be attained by limiting the octane number or the lead content both of regular and premium gasolines, the committee suggested.

Bottom-Hole Pressure Increases in East Texas

AUSTIN, Tex.—An increase of 2.14 lb. in bottom-hole pressure in the East Texas field was registered in September, lifting the average to 1,010.16 lb. on October 1, the Railroad Commission reported here this week.

Col. E. O. Thompson, member of the Railroad Commission, concluded that the return of salt water to the Woodbine sand and the most recent operating order limiting withdrawals to a ratio of 5 bbl. of water to 1 bbl. of oil, give the commission effective means of halting the pressure decline in East Texas.

The Court of Civil Appeals in Austin last week upheld the validity of the water-oil ratio order, holding that the rule did not conflict with the marginal-well law.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Consumers Join Producers

THE gathering of congressmen last week to discuss petroleum matters was one of the most significant developments, oilwise, of the war period.

The group adopted resolutions favoring petroleum price advances and appointed a committee which has since conferred with the price administration. This should end the impasse in regard to government action, favorable or otherwise.

More important is the fact that 125 members of the lower house would attend a meeting seeking greater consideration for the petroleum industry.

It probably was a shock to those who are now directing emergency politics that the meeting was attended by representatives from the East, the Middle West, and other areas whose crude-oil production and refinery operations are either of minor importance or do not exist.

These representatives from the nonoil states were there in the interest of consumers who have found out that petroleum products, except for food and clothing, are their most essential commodity. In fact, as one congressman pointed out, millions would give petroleum the highest rating because of its direct bearing on their ability to make a living and to do their part in the war effort.

These consumers are asking their national legislators to find out what is going on in oil and what could be done to strengthen its operating position. They seek assurance that the military will have sufficient supplies for the duration. Then they want to know if there is petroleum to support civilian activities all of which are directly related to the time required for victory.

Attacks on the petroleum industry in the form of court suits, the various types of investigations and official statements no longer satisfy car owners.

In the past no one outside the oil industry questioned the accuracy of charges which presumably had vote-getting possibilities. Consumers then were obtaining all the petroleum they required at low prices and were not concerned as to the soundness and the fairness of governmental oil policies.

But shortages have ended this complacency. Retail buyers of gasoline, furnace oils and scores of other essential oil products are beginning to ask intelligent questions. The answers given them by the petroleum industry will be weighed against those obtained from other sources.

How effective these answers can be has been demonstrated numerous times by the favorable reports coming from investigators after they had spent weeks and months of inquiry into all phases of the industry's operations.

The Joneses and Smiths want a continuance of petroleum's numerous services—as much as possible during the emergency with a return to normalcy when peace returns.

They can be shown that many of the things that have been done in the past and are being done now by the Government under emergency conditions have no justification and have circumscribed the industry's efforts. They, as well as oil operators, are the victims.

What this means is that petroleum is rapidly becoming a 48-state rather than an 8 or 10-state enterprise. The main streets and the crossroads are moving in on oil. Public reactions will determine the path which petroleum will follow. What will finally happen will depend solely on how well this industry's accomplishments are presented.

Labor Shortage and Rising Rate of Drilling Hold Contractors' Interest

by Harry F. Simons and E. H. Short, Jr.

HOUSTON, Tex.—Current shortages of labor for drilling crews held the center of the stage at the annual meeting of the American Association of Oilwell Drilling Contractors here last week. The equipment situation came in for considerable discussion. Prices, both of oil and per-foot drilling, were almost entirely absent. E. O. Thompson, Texas Railroad Commission member, discussed price in his talk at the banquet session and pointed out that the 25-cent increase which he first advocated 2 years ago would now be inadequate and it would require a 50-cent rise to achieve the desired results.

With the recent trend in drilling being upward and the demands for men in the armed forces growing, the current situation, as far as drilling personnel is concerned, is bad and growing worse, according to comment at the meeting. However, under plans now being formulated but not yet in operation some relief may be obtained by recruiting former oilfield workers who are currently employed in defense plants.

Government Men Confirm Activity

From the tone of government representatives addressing the contractors it was plain that oil production and oil-well drilling operations were rising in importance in Washington.

Discussion following the paper delivered by Samuel E. Hill, PAW associate labor counselor, was extremely lively. (Part of the paper appeared on pp. 47 and 48, Oct. 7.) Mr. Hill outlined the events leading up to the present labor shortage and reviewed recent developments affecting drilling crews, including the abolition of area wage brackets of WLB and the establishment of a minimum wage scale in PAW Districts 2, 3 and 4 with the exception of Ohio.

The increased rate of drilling and rising demand of military forces for personnel combine, contractors declared at their annual meeting in Houston last week, to intensify critical aspects of the manpower situation. A paper discussing manpower problems and what PAW is attempting to do for relief, and another dealing with the equipment outlook presented before the contractors were published in the October 7 Journal, pages 36 and 47. A discussion of operating problems arising from the use of emergency steels presented by M. Lyle Cashion, Gulf Oil Corp., Houston, will appear in the Engineering and Operating Section October 21.

Hill also outlined the plan whereby an attempt will be made to get skilled workmen formerly employed on drilling rigs out of the defense manufacturing plants.

Questions from the floor concerned whether the return of these workers would be on a voluntary basis, clarification on the procedure to raise wages to the minimum, the raising of wages of tool pushers and supervisory employes. The PAW representative replied that the recruitment would be on a voluntary basis but every effort would be made to persuade the men to return to the oil fields and at the existing wage rates. Tool pushers and supervisory employes will be allotted wage increases through WLB so their pay is equal or a little higher than the monthly pay of the hourly-rated employes.

Suggestions from the floor included the release of a specified number of qualified drilling workers from the armed services, the use of publicity to locate former field workmen, more expeditious handling of applications to drill as a prevention of lost time and the establishment of an industry-wide blanket certificate of availability.

Replacement Schedules Explained

Discussing manpower and selective service, Maj. John D. Copeland, Jr., manpower division, Texas Selective Service Bureau, Austin, said that for the drilling contractors the draft problem became worse on October 1 when the drafting of fathers began as not all of the men working on rigs come under the critical-occupation classification. Manning tables and replacement schedules will be very helpful. Replacement schedules are really "retention schedules" if the man can be kept working. If replacement schedules are made out and filed, said Major Copeland, the state Selective Service Board will permit the deferment of fathers for 6 months providing they do essential work. Local boards will not give consideration to anything but critical occupations if the replacement schedules are not filed.

In closing, Major Copeland pointed out rather bluntly that the Selective Service Board knew it could get men for the armed services but that it was up to the drilling contractors to let the boards help them keep men in the drilling industry by filing replace-

John Chapman, Grey Wolf Drilling Co., Houston, Tex., vice president; Arch H. Rowan, Rowan Drilling Co., Fort Worth, Tex., new president, and N. H. Wheless, Shreveport, La., retiring president

ment schedules with the state boards.

R. V. Shirk, chief of the PAW manpower section, explained that there was no national manpower shortage but there was a critical misapplication of manpower. Mainly to blame were the cost-plus manufacturers who had fortified themselves with unnecessary and unused manpower to the detriment of other war industries. PAW is making every effort to get men skilled in the oil industry out of such plants and is working closely with WMC and other agencies on the problem.

Mr. Shirk suggested that the use of some ingenuity on the part of the drilling contractors would be helpful in the situation and cited a case where one contractor is operating rigs with 60 convicts. He said that if a price increase came tomorrow, it wouldn't help get one man back into the oil field. Building up the morale of the men working on drilling rigs is important, according to Mr. Shirk, and no contractor should miss the opportunity to tell the men of the essentiality of their jobs. In one instance the adoption of an arm band with "Petroleum Worker" on it was very helpful. A second step is to tell every government agency and personal and business acquaintance outside the petroleum industry of the desperate situation regarding the labor problem and the imminent shortage of petroleum because of it.

W. D. Gallier, principal WMC field supervisor, Dallas, Tex., outlined the development of the labor shortage and the WMC steps to meet the problem. He said that these efforts had been directed toward stopping the flow of labor from essential to less essential industries and the direction of labor into critical industries and plants. If the present effort, which includes the voluntary shift of workers into vital industries, is a failure, the nation is faced with the drafting of civilian labor.

Considerable discussion on certificates of availability followed Mr. Gallier's talk. One contractor said he was having difficulty because he required such certificates whereas others appeared not to. He wanted to know what could be done about it and what the penalty was for violation. He cited that out of 75 men quitting his pay roll, only 6 had obtained such certificates and that the labor turnover was tremendous, on one pay day alone amounting to 22 men. Mr. Gallier replied that there was no direct penalty but under the Second War Powers Act a fine of $1,000 could be levied on both employer and employe but that so far such a penalty had not been invoked. Mr. Gallier suggested that a whole-hearted attempt be made to put into operation the new program of voluntary recruitment of workers through WMC and a central agency established by the contractors.

Another contractor pointed out that in his area a plan of friendly phone calls to new employers of men not having certificates of availability had been effective in reducing labor turnover.

J. E. Brantly, Drilling & Exploration Co., Dallas, Tex., first president of the association; J. E. Warren, Carl B. King Drilling Co., Midland, Tex., author of one of the papers at the Tuesday session and newly elected vice president for rotary tools; Glenn A. Campbell, chief of the priorities unit, PAW, Washington, D. C., and a member of the contractors' association, who addressed the group on the materials situation, and K. B. Knox, Petroleum Well Servicing Co., Houston, elected to the newly-created office of vice president for well-servicing tools

Materials Problem

A paper prepared by D. R. Knowlton. PAW director of production, was read by C. W. Heston of that agency. Mr. Knowlton stated that required oil production will reach 4,400,000 bbl. daily and will remain at that level throughout 1944. This will require more wells to be drilled and the drilling industry is meeting the demand by stepping up its operations. There are 377 more rotary rigs and 136 more cable-tool rigs running now than in January of this year. This increase in activity, accomplished under adverse conditions, will result in the drilling of 19,000 wells during 1943 and the program of PAW calls for drilling 24,000 wells in 1944. To do this will mean the maintenance of the present rate of drilling throughout 1944.

The record shows, according to Mr. Knowlton, that 3,400 wildcats may be drilled this year, far short of the 4,500 exploratory tests needed. The average pool discovered has been small and it will be necessary to increase the number of wildcats drilled to 5,000 during 1944 if the oil supply is to keep up with the withdrawals.

There were numerous questions from the floor pertaining to drill-pipe supply, the operation of mill and field stocks, possibility of obtaining trucks and truck-repair parts for the drilling industry, and an availability of engine parts. The replies by Frank A. Watts, PAW director of materials, were reassuring although the drill-pipe, and more particularly the tool-joint, situation was referred to as spotty. PAW has been in consultation with WPB and ODT and a plan has been worked out so that by the first of 1944 there should be a reasonable supply of truck repair parts and by the middle of next year some trucks available. Internal-combustion engines are war units, but a plan has been formulated for providing a flow of parts and engines into the drilling industry, according to the speaker.

Glenn A. Campbell, chief of the PAW priorities unit, briefly reviewed the material and manpower situation. Materials needed for drilling operations, he said, should be considered on the "must program." Rock-bit and tool-joint production are now keeping up with drilling activity. The schedule of one large manufacturer of drilling equipment includes an increase of 300 per cent in the building of rig drives, 130 per cent in slush pumps, and smaller advances in other equipment to keep pace with the program.

Drilling Has Preferred Status

The drilling industry is already the preferred part of the oil industry according to C. E. Naylor, District 3's director of materials, who cited that most purchases by contractors are entitled to an AA-1 rating. He also described field stocks of tubular material in District 3 which are designed to care for wildcats and emergencies. These mostly contain casing and tubing, the 20,000 ft. of drill pipe which was located there having been distributed among eight drilling organizations. The materials-redistribution plan has made available a considerable quantity of casing, tubing, line pipe and second-hand drill pipe suitable for shallow drilling.

The condition of drilling rigs and the experience and capabilities of the personnel are below peacetime standards, according to J. E. Warren, Carl

(Continued on page 109)

Federal Order Digest

PAW Regulations

Motor Fuel — Recommendation 1: Revoked. It urged voluntary cut of 33⅓ per cent in northeastern states, revoked September 30.

Motor Fuel — Recommendation 3: Revoked. Limited deliveries by tank trucks and other bulk transport in northeastern states, revoked September 30.

Administration—PAO 11, Supplementary Order 4, amended: Grants additional authority over spacing and other drilling operations in District 5 to the PAW district director in charge at Los Angeles, Calif., effective October 6.

Motor Fuel — Petroleum Directive 74: Authorizes service stations to agree upon the operating hours to meet the needs of individual communities, issued October 7.

Motor Fuel—PAO 4, revoked: Previously limited service-station hours of operation on a nation-wide basis, issued October 7.

WPB Orders

Synthetic Tires — Announces 41-million pound expansion in production program for high-tenacity rayon yarn to promote manufacture of synthetic-rubber tires, issued October 5.

Controlled Materials — C M P R 1, Supplement 1: Revokes Direction 13 of CMPR 1, freeing prime and secondary consumers from submitting complete bills of materials, issued October 9.

Controlled Materials — C M P R 1, Direction 34: Establishes procedure for purchasing Class A facilities from manufacturers where an allotment of controlled materials is needed but may not be obtained under procedure outlined in CMPR 6, issued October 4.

Chemicals—MCO M-340: Bring five additional chemicals, oxidized petrolatum, vinsol resins, methyl abietate, hydrogenated methyl abietate and cellulose sponges, under allocation, effective November 1.

Telephone Service—Utility Order 2, amended: Adds petroleum operators to the list of essential occupations for which telephone service may be granted. Applications must be approved by PAW, issued October 9.

Fibre Containers—LO L-317: Restricts the use of fibre containers and controls manufacture, issued October 11.

Controlled Materials—CMPR 1, Interpretation 19: Clarifies distinction between the use of allotment numbers for identification purposes by Class A and Class B product manufacturers, issued October 8.

OPA Regulations

Appointment—Col. Bryan Houston as deputy administrator of rationing, succeeding Paul M. O'Leary, resigned, announced October 9.

Crude Oil—MPR 436, Amendment 3: Authorizes advance of 20 cents per barrel in Franklin heavy-sand crude oil produced in Venango County, Pennsylvania, effective October 9.

Tires—RO 1A, Amendment 55: Modifies rationing restrictions on eligibility for used passenger tires, permitting passenger-car owners who have been ineligible for tires to get Grade 3 tires if they have obtained a "special" ration for any purpose except furlough travel, effecive October 13.

Bomber Crews Visit 30 Aviation Plants To Stimulate Morale

WASHINGTON, D. C. — A morale-building campaign among construction workers to speed completion of 100-octane refineries is being conducted by the Army, Petroleum Administration for War, and refineries concerned.

Two Army bombers and their crews, just returned from active service, are making a tour of the plants under construction and telling the workers the importance of their war jobs and the necessity for getting the plants finished and on stream at the earliest possible moment.

Various publicity and incentive devices are being used, including distribution to workers of a personal letter from Administrator Harold L. Ickes, and copies of a "comic book" showing fighting planes in action and their dependence on the fuel to be produced from the new plants. This 16-page booklet, done in the popular "comic strip" style of colored drawings, was conceived by Bruce K. Brown, assistant deputy administrator of PAW.

The bombers and their crews visited or were to call at 30 aviation-gasoline projects in various parts of the country.

The Old Hellcat visits started October 6 at the Standard Oil Co. of New Jersey plant at Baltimore, Md. Other calls were made and scheduled at Pennzoil Co., Oil City, Pa.; Pure Oil Co., Toledo, Ohio; Standard Oil Co. (Indiana), Whiting, Ind.; Socony-Vacuum Oil Co., East St. Louis, Ill.; Premier Oil Refining Co. of Texas, Cotton Valley, La.; Root Petroleum Co., El Dorado, Ark.; Standard Oil Co. of Louisiana, Baton Rouge, La., Crown Central Petroleum Co., and Eastern States Petroleum Co., Houston, Tex.; J. S. Abercrombie-Harrison Oil Co., Sweeny, Tex.; Pan American Oil & Transport Co., Southport Petroleum Co., and Republic Oil & Refining Co., Texas City, Tex.; Gulf Oil Corp., and the Texas Co., Port Arthur, Tex.; Great Southern Co., and Sinclair Refining Co., Corpus Christi, Tex.

Schedule of the Desert Warrior will start October 16 with a stop at the Associated Refineries, Inc., plant at Duncan, Okla. The itinerary includes Champlin Refining Co., Enid, Okla.; Continental Oil Co., Ponca City, Okla.; National Refining Co., Coffeyville, Kans.; Frontier Refining Co., Cheyenne, Wyo.; Sinclair Refining Co., Sinclair, Wyo.; Utah Oil Refining Co., Salt Lake City, Utah, and Mohawk Petroleum Corp., Bakersfield, Calif.

Buttram Will Retire As I.P.A.A. President

OKLAHOMA CITY, Okla.—Frank Buttram, of this city, who has served as president of the Independent Petroleum Association of America since 1939, will retire at the association's annual meeting in Fort Worth, Tex., October 25-27. Mr. Buttrom made this announcement last week.

Charles F. Roeser, of Fort Worth, former president, is under consideration to succeed Mr. Buttram, according to leaders in the membership.

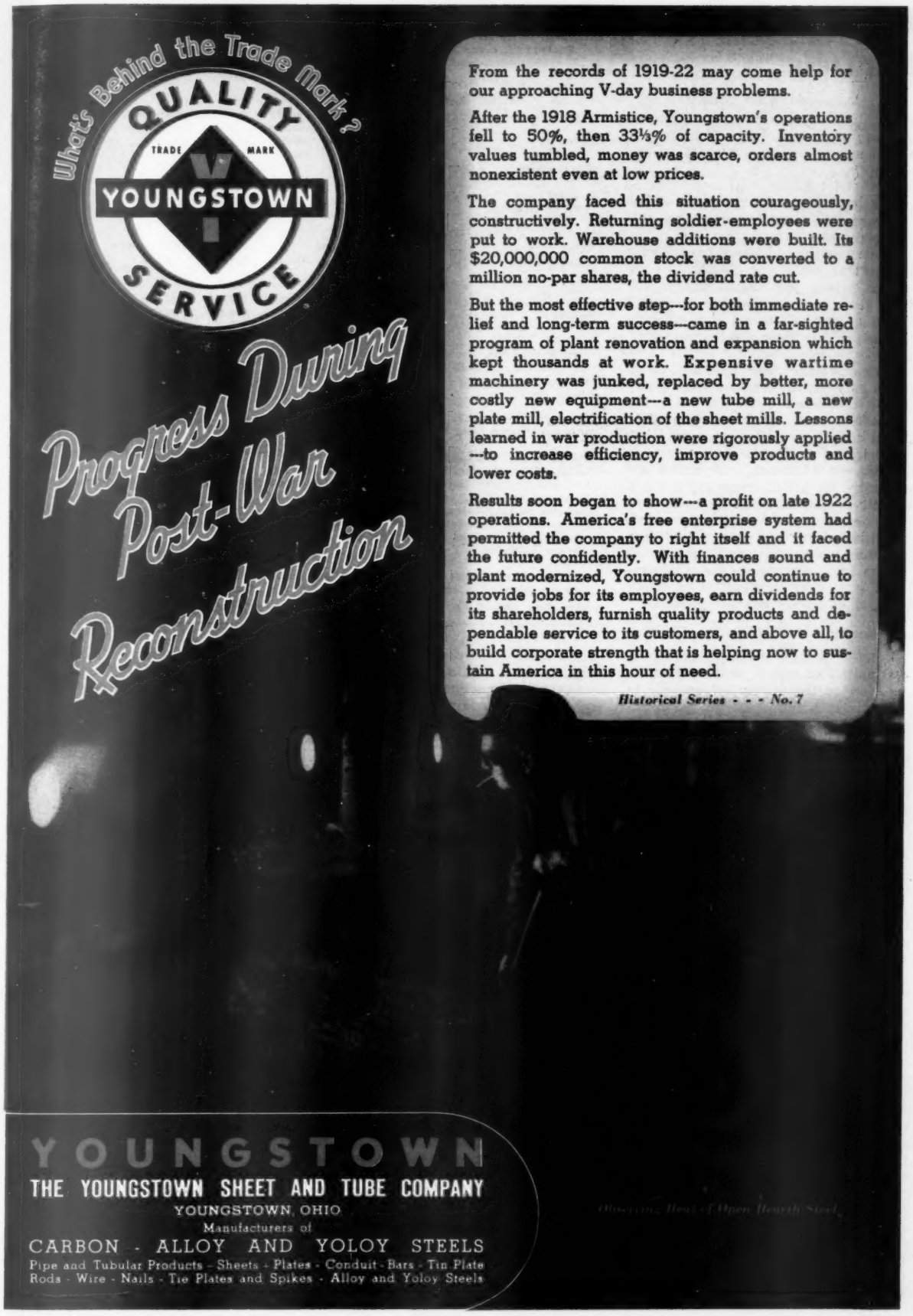
Natural Gasoline Corp. Builds Plant at Hawkins

Natural Gasoline Corp. and the Humble Oil & Refining Co. are constructing a 60,000-gal. natural-gasoline plant and gathering lines at Hawkins, Tex. On page 84 of this issue this plant was reported as an operation of Warren Petroleum Corp., with which Natural Gasoline Corp. is associated.

Mississippi Geologist Reports on New Structure

OXFORD, Miss. — A geological structure of the type favorable to oil and gas accumulation, discovered east and south of Plantersville by Dr. H. R. Bergquist, micro-paleontologist, during the joint field investigations by Lee County and the Mississippi State Geological Survey, was announced last week by Dr. William C. Morse, state geologist.

Dr. Morse and his staff are working on the bulletin that is to be issued on Lee County in summarizing the studies and findings made as a result of the joint field investigations.


What's Behind the Trade Mark?
QUALITY
TRADE MARK
YOUNGSTOWN
SERVICE
Progress During Post-War Reconstruction
From the records of 1919-22 may come help for our approaching V-day business problems.
After the 1918 Armistice, Youngstown's operations fell to 50%, then 33⅓% of capacity. Inventory values tumbled, money was scarce, orders almost nonexistent even at low prices.
The company faced this situation courageously, constructively. Returning soldier-employees were put to work. Warehouse additions were built. Its $20,000,000 common stock was converted to a million no-par shares, the dividend rate cut.
But the most effective step---for both immediate relief and long-term success---came in a far-sighted program of plant renovation and expansion which kept thousands at work. Expensive wartime machinery was junked, replaced by better, more costly new equipment---a new tube mill, a new plate mill, electrification of the sheet mills. Lessons learned in war production were rigorously applied ---to increase efficiency, improve products and lower costs.
Results soon began to show---a profit on late 1922 operations. America's free enterprise system had permitted the company to right itself and it faced the future confidently. With finances sound and plant modernized, Youngstown could continue to provide jobs for its employees, earn dividends for its shareholders, furnish quality products and dependable service to its customers, and above all, to build corporate strength that is helping now to sustain America in this hour of need.
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Facilities for Processing Sour Crude

(Continued from page 27)

which will necessitate using facilities not now used therefor, will be forced as a consequence to lower its crude-oil input.

In District 2, potential input capacity is gradually built up about 40,000 bbl. per day between now and the third quarter of 1944.

In District 3, additional capacity to the extent of about 39,000 bbl. is added during the fourth quarter of this year and approximately 88,000 bbl. per day additional input facilities are added in the first quarter of 1944.

District 4 adds about 7,500 bbl. daily input capacity during the first quarter of next year.

There appears to be no net additional capacity coming into operation in District 5 during 1944.

Total net additions to potential input rates in all districts result in a capacity availability of approximately 260,000 bbl. per day in the country as a whole over and above the levels of crude run to stills as programmed by the PAW during the fourth quarter of next year (less estimated crude charged to purely asphalt plants).

TABLE 3

Estimated Daily Average Runs to Stills of West Texas-New Mexico High-Sulfur Crude in Districts 1, 2 and 3, Total Capacity of Present Equipment and Probable Capacities Remainder of 1943 and 1944, Compared With the Required Utilization of These Crudes (in Barrels)

	Estimated dly. runs month Sept.	Daily capacity present equipment	Fourth quarter 1943	Daily potential input rates, 1944 — First quarter	Second quarter	Third quarter	Fourth quarter
District 1:							
East Coast	95,000	140,000	140,000	140,000	140,000	140,000	140,000
Appalachian	None	None	.....	.....	None	.....	.....
Total	95,000	140,000	140,000	140,000	140,000	140,000	140,000
PAW program	.....	.....	120,000	123,000	133,000	154,000	158,000
District 2:							
Total	50,000			Not available			
Anticipated*	.....	.....	90,000	105,000	115,000	115,000	115,000
District 3:							
Coastal	202,400	202,400	202,000	202,000	202,000	202,000	202,000
Inland	79,500	81,900	82,000	82,000	82,000	82,000	82,000
Total	281,900	284,300	284,000	284,000	284,000	284,000	284,000
PAW program	.....	.....	284,000	284,000	284,000	284,000	284,000
September runs combined area	426,900	.....	.....	.....	.....	.....	.....
Total potential input in Districts 1 and 3 plus anticipated runs in District 2			514,000	529,000	539,000	539,000	539,000
PAW program amounts:							
Estimated production Permian basin			480,000	502,000	532,000	588,000	604,000
Availability including stock withdrawal			491,000	512,000	542,000	623,000	639,000
Permian crude utilization necessary above current estimates of potential capacity in Districts 1 and 3, plus anticipated runs to District 2, if program balanced			.....	.....	3,000	84,000	100,000

*From PAW Refinery Division, and program section report.

Note: Districts 1 and 2 are now studying this situation in detail and more definite information should be available shortly.

Capacity for High-Sulfur Crude

Related to the general subject of availability of refinery capacity is the question of the ability of refiners in Districts 1, 2 and 3 to run the high-sulfur crude of the Permian basin and similar types. The forecast of United States crude producibility recently compiled places the maximum efficient rate (M.E.R.) of District 3 at approximately 2,570,000 bbl. which level of production is expected to be reached about the middle of 1944. If this rate of crude output is to be achieved and if refinery operation is to reach a level equivalent to that much crude production in District 3, the daily output of the Permian basin must reach approximately 600,000 bbl. This entire amount plus withdrawals of this type of crude from storage amounting to a maximum of 35,000 bbl. a day in the fourth quarter of 1944, must be utilized by refiners if the PAW long-term balanced program is to be fulfilled.

At the present time about 425,000 bbl. of high-sulfur crude are being run to stills in Districts 1, 2 and 3. Of this amount District 3 is running the major portion—about 280,000 bbl. daily. District 1 is running about 95,000 bbl. daily and District 2 is running about 50,000 bbl. per day according to the best estimates currently available.

In District 1 there is at the present time between 40,000 and 45,000 bbl. daily additional high-sulfur capacity and all of this is located in the so-called East Coast district. The actual quantity that could be run would, however, be dependent upon the quality of the remaining portion of the over-all crude supply. Studies are now being made to determine to what extent high-sulfur crude can be run in District 1 during the fourth quarter of this year and throughout 1944 but it would appear, on the basis of current available information, that the daily potential input of Permian crude in this district should total 140,000 bbl. daily over this entire period. In comparison with this figure the PAW long-term program indicates that District 1 may be required to run 154,000 and 158,000 bbl. daily of this type of crude in the third and fourth quarters of 1944.

District 2 Outlook

No figures are available for District 2 as to the present capacity of equipment capable of running high-sulfur crudes. According to the PAW Refinery Division and program section, that district is now expecting to reach a level of 115,000 bbl. daily in the second quarter of next year and to hold that level throughout the remainder of 1944. If District 2 is to keep its total crude runs up to program levels it will have to increase its use of high-sulfur crude from the 115,000 bbl. indicated above to 159,000 bbl. daily in the third quarter.

District 3 runs of high-sulfur crude are not quite up to the capacity of its present equipment. However, if the additional 13,600 bbl. daily which the coastal plants could run were actually charged to stills this would necessitate a corresponding reduction in the throughput of other crudes which would affect the current rate of production of war products.

The district's potential input rate of high-sulfur crude totals 284,000 bbl. daily beginning with the fourth quarter of this year and running through 1944. It is anticipated that this capacity will be fully utilized during that period.

The daily potential input of Districts 1 and 3, plus the anticipated runs in District 2, reach a level of 539,000 bbl. daily in the second quarter of 1944 where it remains throughout the rest of that year. The utilization of Permian basin crude necessary to balance the industry's operating program as it is now foreseen for the last three-quarters of 1944, average 542,000, 623,000, and 639,000, which levels, when compared with the currently anticipated input rates, show that 3,000 bbl. daily in the second quarter, 84,000 bbl. in the third quarter and 100,000 bbl. daily in the fourth quarter will have to be run over and above present foreseeable rates if the high-sulfur crude portion of the industry's refinery operating program is to be realized. This means that the construction or adaptation of refinery equipment to handle such crudes must be above projected rates.

First Commercial TCC Unit Goes on Stream

(Continued from page 31)

enough to warrant the construction of 29 reactor-kiln units.

Evidence that the primary objective was attained is given in Table 1. The motor-gasoline specifications shown in this table cover a wide range of stocks. While good yields of high-quality gasoline can be obtained from most stocks with the pelleted-clay catalyst, the yields and qualities with the bead catalyst are superior. It is interesting to note that, with the bead synthetic catalyst, a yield of approximately 36 per cent motor gasoline testing 100-research octane with 1 cc. TEL was produced from Houdry cycle gas oil. With the bead synthetic catalyst, motor gasoline from all stocks that have been tested so far shows substantially higher than 95-research octane with 3 cc. TEL added.

During initial stages of development, a natural granular catalyst of 8-30 mesh, physically similar to percolation clays for which the Thermofor kiln was designed, was used. It later became evident that a pellet-type catalyst, less susceptible to attrition losses, could be used. This was also a natural-clay catalyst. However, before the first commercial unit was put on stream an entirely new development in catalysts was discovered by the Socony-Vauum research and development organization. This is the translucient, spherical type announced earlier this year, known as the "bead" catalyst. Adoption of this catalyst not only reduced attrition rates markedly but also resulted in better yields. Its original activity is considerably higher than the previously used pelleted-clay catalyst and this activity is maintained much better.

Development of the process was under the supervision of T. P. Simpson, who is in charge of the development section of the research and development division of Socony-Vacuum. Associated with Mr. Simpson in this work were L. P. Evans, C. V. Hornberg, T. W. Nelson, J. W. Payne and M. M. Marisic. The engineering design was done by the company's refinery engineering division under the supervision of G. S. Dunham.

TABLE 1—PROPERTIES OF TYPICAL SINGLE-PASS MOTOR GASOLINES FROM TCC CRACKING

	Pelleted-clay catalyst		
	Coastal gas oil	Mixed base	Paraffinic gas oil
Charge stock:			
Gravity, °A.P.I.	30.3	....	33.6
Boiling range, °F.	420-640	....	440-700
Gasoline:			
Gravity, °A.P.I.	54.2	60.0	60.6
R.V.P., lb. per sq. in.	10.1	9.7	9.6
Copper dish gum, mg.	....	27	5
Color Saybolt	....	10	....
Octane No. (C.F.R., M.M.):			
Clear	80.8	78.1	78.7
1 cc. TEL	....	....	....
3 cc. TEL	....	....	....
Octane No. (C.F.R., Res.):			
Clear	86.7	87.4	84.9
1 cc. TEL	92.4	93.1	91.2
3 cc. TEL	96.6	96.0	94.7
A.S.T.M. distillation, °F.:			
Initial boiling point	96	89	99
10 per cent	123	119	124
50 per cent	247	240	230
90 per cent	370	365	360
End point	406	398	400
Gasoline yield, vol. % of charge	62.7	....	54.1

Note: Corresponding data on products obtained when using the new synthetic "bead" catalyst were omitted by the censor for reasons of military safety.

Pipe-Line Proration Reappears in West Texas

FORT WORTH, Tex. — Pipe-line proration reappeared in the West Texas Permian basin last week when Humble Pipe Line Co., advised producers that it would take restricted quantities from four fields in Ector and Andrews counties during October. Humble announced that its line serving the four fields was unable to handle the per calendar day allowable of 38,955 bbl. The cuts instituted by Humble reduced the output from the fields to 35,087 bbl. daily.

North Cowden was cut to 86 per cent of the Railroad Commission allowable, lowering daily runs to 20,856 bbl. The Mascho field was restricted to 83 per cent of the allowable while both Emma and Fuhrman were cut to 96 per cent of Railroad Commission quotas.

DEATHS

Authur Paul Bonner, 46, of Phillips Petroleum Co., died last week at his home near Sperry, Okla.

John Lee Tildsley, Jr., 44, manager of the Chicago, Ill., branch of Reilly Tar & Chemical Co., of Indianapolis, Ind., died in Chicago, September 26.

Charles P. Teeple, vice president and director of research of Crane Packing Co., Chicago, Ill., is dead. Mr. Teeple held a doctor's degree in metallurgy from University of Michigan and was a member of the Society of Automotive Engineers and Illuminating Engineers Society.

Sidney Gano Estill, 55, for the past 41 years an employe of Oklahoma Natural Gas Co., died last week at his home in Tulsa, following an illness of 3 years. He had lived in Tulsa since 1915.

Charles Hanlay, 55, representative of New England Standard Aguilla Oil Companies, at Tampico, Mexico, for 20 years, died last week at Laredo, Tex. Mr. Hanlay went to Laredo 4 years ago.

Pvt. Harold Boardman, 22, former employe of Kendall Refining Co. before entering the service July 29, 1942, has been officially listed as killed in action by the War Department. His home was in Salamanca, N. Y.

Edward L. Dearolph, 63, former drilling contractor, who operated in the West Virginia and Kentucky fields, died last week at Warren, Ohio, where he had made his home for the past year, following 19 years' residence in Oil City, Pa.

Richard O. Hodges, 44, employe of Sinclair Oil Co., died in a Tulsa hospital last week after a long illness. He had recently moved to Tulsa from Seminole, Okla.

Ernest R. Ratcliff, 69, president of the Hercules Gasoline Co. and Atlas Oil Corp., and interested in numerous petroleum properties in East Texas and North Louisiana, died last week at Shreveport, La.

Walter F. Skaer, 51, who entered the oil industry as an independent operator in 1917, died in a Wichita, Kans., hospital last Sunday. In 1919 he and Willis L. Hartman formed a partnership and had a hand in opening several Kansas oil pools. In recent years he operated independently.

M. B. Hutchison, 86, retired pioneer oil man, died recently at Bartlesville, Okla. Mr. Hutchison went to Bartlesville in 1913 as manager of Wiser Oil Co., later became vice president and director. He retired 22 years ago.

J. V. E. Dickson, engineer with E. B. Badger & Sons, Boston, Mass., for the past 17 years, died of a heart attack September 28 in Cleveland, Ohio, where he had been assigned to a refinery-construction project since July 1942. Mr. Dickson had designed and operated plants for the petroleum industry in various parts of the United States, in Mexico and in England. During World War 1 he was connected with the Bethlehem Steel Co.

Testing fuel injection pump at American Bosch. Fit of plunger and barrel is so close that the only practical test is to measure the time the assembly will hold fuel oil at several thousand pounds pressure.

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AVIATION AND AUTOMOTIVE ELECTRICAL PRODUCTS . . . FUEL INJECTION EQUIPMENT

MODERN CRAFTSMEN IN THE NEW ENGLAND TRADITION

Refining West Texas Crude

by H. H. Wenzke*

Refining high-sulfur West Texas crudes becomes a series of "know how" steps which have been developed by refiners handling these crudes, this author shows. West Texas crudes vary widely in sulfur content, even from different horizons in the same well. Total sulfur content does not indicate specifically the kind and degree of refining necessary. At cracking temperatures alloys are required to keep down corrosion. Five to twenty pounds of 93 per cent sulfuric acid will reduce sulfur in gasoline to a low figure, generally speaking.

ONE area which could increase its rate of production and supply the additional amount of crude so urgently needed to keep our refineries operating at maximum capacity is the Permian basin of West Texas. This fact is generally recognized, and provision is being made to furnish the additional transportation facilities required to deliver the crude into the Mid-Continent pipe-line system from where it can be distributed to those refineries requiring additional sources of crude.

The crude oils produced in West Texas are sour crudes, that is, they have a sulfur content sufficiently high to require careful handling and special processing. However, since West Texas seems to be our only immediately available source of increased crude production, and since this oil possesses both advantages and disadvantages as compared with Mid-Continent crudes, it is essential to study the problems with which the Mid-Continent refiner will be confronted when he augments his present supply with crude oil from West Texas, and to examine the procedures which the West Texas refiners have developed for satisfactorily handling these crudes.

The two major problems which confront the refiner of sour oils are:

1. Excessive corrosion of his equipment and facilities.

2. The necessity for more drastic treatment to produce marketable finished products.

If the necessary precautions are observed, the difficulties encountered on both of these scores can be arrested or overcome. This discussion deals with the general nature of the problems encountered in refining West Texas oils, the provisions which should be made to overcome them, and the results that may be anticipated. The data are taken from actual records of both commercial and laboratory work; and the problems are presented in their most acute form, since they deal with running West Texas oil unblended.

There are considerable variations in the quality of the West Texas crude oils. For example, the crude from the Hendrick field may have a gravity of 24.4° A.P.I. with only 11.4 per cent of 400° F. end-point gasoline, while a sample from the Sand Hills field in Crane County may have a gravity of 45.3° A.P.I. with 37.6 per cent of 400° F. end-point gasoline.

While it is well known that the raw oil usually has a high sulfur content and often a high salt content, there are exceptions to these generalizations. A sample of oil from the Texon level in Pecos County was found to contain only 0.25 per cent sulfur, while a sample from a shallower pool in the same county contained 1.5 per cent. Crudes have also been found that have a total sulfur content of 3.0 or 4.0 per cent.

The salt content also varies considerably with the pool. This quantity ranges from a negligible amount to as much as 300 to 400 lb. per 1,000 bbl. In some cases the salt is present in the form of a brine, while in others it is present in the form of crystals. These crystals may be covered with a hydrocarbon layer which makes dissolving them rather difficult. The technique of dissolving the crystals however, has been much improved in recent years. New methods have been developed for dissolving and removing the salt associated with the crude. Electrical methods have also been used satisfactorily to reduce the salt content.

The chemical forms in which the sulfur is present in a crude oil are difficult to determine. Usually only a small portion is present as free sulfur, and there are minor quantities in the form of hydrogen sulfide and mercaptans. In the distillation of the crude the higher boiling fractions usually have a higher concentration of total sulfur than the lower boiling fractions. This is illustrated by the analysis of a Slaughter-Duggan crude and some of its fractions shown in Table 1.

The Slaughter crude referred to in Table 1 was fractionated to produce 600° F. end-point distillate having the properties shown in Table 2. The reduced crude from this distillate had the properties given in Table 3. Sufficient 600° F. end-point distillate was blended back with the reduced crude to produce a 20° A.P.I. gravity blend for use as a charging stock to the cracking unit. This blend duplicated the properties of the fraction fed to the cracking coil of the commercial unit. The results of this operation will be discussed later in this article. The properties of this blend, which is 60 per cent of the original crude oil, are given in Table 3.

The 20° A.P.I. blend was cracked thermally in a Dubbs pilot plant to produce a 400° F. end-point gasoline and Bunker "C" residuum. The results of this test are shown in Table 4.

Treatment of Gasolines

In general, the sulfur compounds exert only a minor effect on the thermal cracking of hydrocarbons. The principal effect of the sulfur, as will be pointed out, is its influence on the quality of products and its corrosive action on processing and storage equipment.

The sulfur compounds in gasoline have a deleterious effect on the octane number of an unleaded fuel. This harmful effect is greatly magnified when tetraethyl lead is added. In small quantities thioethers and ring sulfur compounds have only a

*Universal Oil Products Co.

TABLE 1

	Crude	400° F. E.P. Gasoline	725° F. E.P. Gas oil*	Topped crude —After— 400 °F.	725° F.
Yield, vol. per cent of crude as received	†100.0	34.1	33.7	65.9	32.2
Analyses of fractions:					
Gravity, °A.P.I. at 60° F.	31.6	56.5	31.6	21.2	12.4
Specific gravity at 60° F.	0.8676	0.7527	0.8676	0.9267	0.9833
Total sulfur, per cent	2.00	0.32	1.60	2.78	3.70
Mercaptan sulfur, per cent	.....	0.138	.....	.....	.....
Hydrogen sulfide, per cent	.....	0.003	.....	.....	.....
Reid vapor pressure, lb.	4.2	7.3	.....	.....	.....
Octane No., motor method clear	...	54.7	.....	.....	.....
Cold test, °F.	25	.....	30	65	90
B.s. and w., per cent	0.3	.....	None	‡0.6	0.7
Sediment by hot benzol extn. (Wiley), per cent	.....	.....	.....	0.009	.....
Conradson carbon residue	.....	.....	.....	5.55	.....
Con. carbon residue, 10 per cent bottoms	.....	.....	0.042	.....	.....
Viscosities:					
Kinematic at 100° F., cst.	5.66	.....	4.385	48.30	.....
Kinematic at 210° F., cst.	.....	.....	.....	6.94	74.61
Universal at 100° F., sec.	44.4	.....	40.3	224	.....
Universal at 210° F., sec.	.....	.....	.....	48.5	345
Flash, Pensky-Martens, °F.	.....	.....	215	210	.....
Salt as sodium chloride, lb. per 1,000 bbl.	§25	.....	.....	.....	.....
100 ml. distillation:					
I.B.P., °F.	129	103	430	435	.....
5 per cent	186	150	464	478	.....
10	218	169	474	498	.....
20	296	197	494	542	.....
30	383	219	514	597	.....
40	481	239	536	647	.....
50	572	259	562	675	.....
60	654	280	584	697	.....
70	698	303	612	713	.....
80	720	330	640	724	.....
90	740	360	678	740	.....
95	748	380	707	.....	.....
End point, °F.	748	400	724	740	.....
Per cent recovered	95.5	98.0	99.0	93.5	.....
Per cent bottoms	.....	1.1	1.0	.....	.....
Per cent loss	.....	0.9	.....	.....	.....
Per cent coke by weight	4.1	.....	.....	6.2	.....
Per cent recovered at 158° F.	.....	7.0	.....	.....	.....
Per cent recovered at 212° F.	.....	27.0	.....	.....	.....
Per cent recovered at 400° F.	32.0	.....	.....	.....	.....
Per cent recovered at 572° F.	50.0	.....	55.0	25.5	.....

*Distillation conducted at 4 mm. Hg when taking the gas-oil overhead.
†Trace of water.
‡Waxy.
§292 lb. per barrel before removing salt.

TABLE 2

Yields, vol. per cent of crude oil:	
Gasoline	34.1
600° F., E.P. distillate	21.1
Topped crude	.....
Reduced crude	44.1
Water	0.2
Recovery	99.5
Loss	0.5
Blend, vol. per cent of crude oil	60.2
Properties of overhead fractions:	Dist.
Gravity, °A.P.I.	34.4
Specific gravity at 60° F.	0.8529
Total sulfur, per cent	1.35
Mercaptan sulfur, per cent	.....
Hydrogen sulfide, per cent	.....
Vapor pressure, Reid, lb./sq. in.	.....
Octane No., motor method	.....
Universal viscosity at 100° F., sec.	35.5
Kinematic viscosity at 100° F., cts.	2.84
Characterization factor	11.60
100 ml. distillation:	
I.B.P., °F.	430
5 per cent	450
10	460
20	472
30	481
40	493
50	507
60	521
70	536
80	555
90	575
95	587
End point, °F.	605
Per cent over	99.0
Per cent bottoms	1.0
Per cent loss	.....
Per cent at 572° F.	89.0

TABLE 3

Fraction removed:	—Reduced crude— 600°F. E.P. distillate	Dist. blend
Gravity, °A.P.I.	15.5	20.1
Specific gravity at 60° F.	0.9629	0.9334
Sulfur, per cent	3.36	2.86
B.s. and w., per cent	0.4	0.2
Cold test, °F.	80	50
Viscosities:		
Universal at 100° F., sec.	.....	336
Universal at 210° F., sec.	127.8	84.5
Kinematic at 100° F., cts.	.....	72.86
Kinematic at 210° F., cts.	27.02	8.74
Flash point, Pensky-Martens, °F.	.....	250
Characterization factor	11.50	11.52
100 ml. distillation :		
I.B.P., °F.	629	460
5 per cent	652	493
10	675	516
20	697	576
30	709	634
40	720	680
50	730	709
60	735	724
70	742	734
80	.....	742
90	.....	748
End point, °F.	735	748
Per cent over	91.0	92.0
Per cent coke by weight	8.8	7.9
Per cent at 572° F.	.....	19.5

slight influence, if any, on the octane number. The mercaptan and disulfides, however, have a directly harmful effect on the antiknock quality of either leaded or unleaded motor fuel. In this respect the disulfides are, perhaps, more harmful than the corresponding mercaptans. The detrimental effect of the mercaptans increases with the number of carbon atoms in the molecule. The harmful effect of sulfur compounds upon the octane number increases in the following order: ring sulfur compounds, thioethers, mercaptans, disulfides, and polysulfides.[1]

Many states have legal restrictions on the maximum permissible sulfur content of gasoline. The federal Government has a 0.25 per cent maximum sulfur limit for gasoline which it purchases for its own consumption. In many cases these sulfur restrictions work a hardship on the refiner.

This is particularly true of those refiners who must produce gasoline from West Texas crudes. The original federal sulfur specifications of 0.1 per cent, which remained in force until recently, was arbitrarily adopted prior to 1920, when most crude oils were sweet. Since these crudes were virtually sulfur-free, no difficulties were encountered in meeting the 0.1 per cent limitation. As so often happens with arbitrary specifications, this sulfur limitation remained frozen for many years, although it was outmoded and an obstacle to the production of refined products from higher sulfur crudes.

Through vigorous efforts, particularly during recent years, the sulfur limit in most states has been raised to 0.25 per cent; and in April 1942, the federal specifications, as mentioned above, was raised to 0.25 per cent. Exhaustive road and laboratory tests throughout the country have thoroughly established that sulfur contents of 0.25 per cent or higher in ordinary motor fuel are not injurious to motors. This fact is confirmed by practical experience obtained in California, where gasolines containing sulfur contents up to and beyond 0.4 per cent are marketed. With the increased production of crude oil from the West Texas fields, every effort should be exerted to raise low sulfur specifications, since within reasonable limits sulfur has no effect on the performance of the product from a standpoint of engine maintenance. Refiners of West Texas crudes are unfairly handicapped where low sulfur specifications are in force.

Untreated gasolines produced from refineries operating on 100 per cent high sulfur West Texas crudes will usually exceed the maximum federal or state sulfur specifications. Sulfur reduction is, therefore, necessary to produce a salable product. In addition, it is usually desirable to effect some sulfur reduction in order to improve the octane number and tetra-

1 Ryan, Indian, Ind. Eng. Chem., 34, 824 (1942.)

TABLE 4

Yields, vol. per cent of charge:	
Gasoline	43.0
Residuum	50.6
Liquid volume loss	6.4
Gas, cu. ft. per bbl. of charge	386
Properties of products—	
Untreated gasoline:	
Gravity, °A.P.I.	59.8
Specific gravity	0.7397
Mercaptan sulfur, per cent	0.17
Total sulfur, per cent	0.60
Vapor pressure, Reid, lb./sq.in.	11.0
Octane No., motor method	70
Characterization factor	11.97
100 ml. distillation:	
I.B.P., °F.	94
5 per cent	116
10	130
20	162
30	194
40	223
50	247
60	270
70	292
80	317
90	351
End point, °F.	399
Per cent over	97.5
Per cent bottoms	1.0
Per cent loss	1.5
Composition, liquid vol. per cent:	
C_5 fractions	0.3
Isobutylene	1.5
N-butylene	3.5
Butanes	4.4
Pentanes to 115° F. (46° C.)	12.9
Fraction boiling above 115° F.	77.4
Total	100.0
Fraction boiling above 115° F.:	
Gravity, °A.P.I.	53.0
Specific gravity	0.7699
Properties of residuum:	
Gravity, °A.P.I.	4.9
Specific gravity	1.0373
B.s. and w., per cent	0.4
Cold test, °F.	40
Flash, Pensky-Martens, °F.	210
Furol viscosity at 122° F., sec.	303
Characterization factor	10.60
100 ml. distillation:	
I.B.P., °F.	476
Per cent at 572° F.	5.0

ethyl lead susceptibility. In certain cases the cost of sulfur removal can be justified by the savings in tetraethyl lead. Where treating facilities are not available to permit adequate sulfur reduction, it is necessary to blend lower sulfur crudes with higher sulfur stocks in order to meet the government sulfur specifications. A number of treating processes can be used to reduce the sulfur content of these gasolines.

West Texas straight-run gasolines seem to predominate in high boiling mercaptans, sulfides and disulfides. High boiling mercaptans are not easily removed by the usual regenerative caustic scrubbing process. In usual commercial practice only 50 per cent or less of the mercaptan sulfur present is removed by caustic scrubbing. Complete mercaptan removal may be obtained by adding substances to the caustic which will increase the solubility of the mercaptans. Methyl alcohol, which is the basis for the Unisol process, may be used for this purpose. However, since mercaptans usually represent only a small portion of the total sulfur present in West Texas straight runs, a much more complete sulfur reduction can be obtained by the use of high-temperature desulfurization processes such as those which use clay or bauxite as a catalyst. The sulfur removal obtained by these processes will vary from 80 to 95 per cent of the total sulfur present.

The cracked gasolines produced from West Texas crudes predominate in mercaptans and ring sulfur compounds. Efficient regenerative caustic scrubbing will remove approximately 80 per cent of the mercaptan sulfur present. With a topped crude charge produced from 100 per cent Slaughter crude, commercial cracking operations produced a gasoline containing a total sulfur content of 0.68 per cent, of which 0.3 per cent was present as mercaptan sulfur. The Unisol process or similar processes will remove all of the mercaptan present, and processes of this type are recommended for treatment of these gasolines. Since the sulfur remaining after mercaptan extraction is predominantly in the form of ring sulfur compounds, which are difficult to remove and exert only a slight influence on tetraethyl lead susceptibility, additional desulfurization beyond mercaptan removal is not recommended. If additional desulfurization is necessary because of arbitrary sulfur specifications, then it will be necessary to resort to expensive and wasteful acid treating. The savings in tetraethyl lead which will result from complete mercaptan removal are sufficiently large to cover the cost of the installation of the plant in a short period of time.

Corrosion in Refining Equipment

One of the most important factors retarding the use of West Texas crude in refining operations is the serious corrosive properties of this stock under ordinary conditions. The following information is taken from inspection reports of a commercial unit processing crude from the Slaughter-Duggan field. When this unit was built, the seriousness of the corrosive properties of the oil was not thoroughly appreciated. At this time alloys were not used as extensively as they are in present-day practice. As a result, it was found that after the first run a very serious corrosive condition existed, and it was realized that extensive replacements would have to be made in order to continue operation. The first inspection revealed that there was severe corrosion in the tubes in the cracking heater that were within the corrosive temperature range, and it was calculated that the life of the carbon steel tubes would be about 3 months. It was also found that there was heavy corrosion in the flash chamber, fractionating column, and various interconnecting lines in this part of the system.

A program was laid out for replacements and maintenance which involved the purchase of 4-6 chrome tubes for the cracking heater and the installation of linings in the vessels which had been affected by the corrosion.

Inspections of the unit after the original steel tubes had been replaced by the chrome tubes showed that these tubes would last for several years. The inspections also indicated that the ganister linings which were installed in the unit had been successful in preventing rapid corrosion, although it was later revealed that the linings themselves might need replacement after a long period of operation. For permanent protection of such vessels, present-day recommendation would be for a 11-13 chrome sheet lining throughout the vessels.

In this plant the crude from the salt settler, containing from 45 to 50 lb. of salt per 1,000 bbl. of crude, was charged to a heater from which it was fed to a fractionating column. This column was operated with a 400° F. end-point gasoline overhead, a gas-oil side cut, and a bottoms which had a gravity of about 20° A.P.I. These bottoms were charged to the cracking coil, the cracked vapors passing through a reaction chamber and flash chamber before reaching the above fractionating column. On cracking, the topped crude produced yields that approximated those of the pilot plant shown in Table 4.

The first inspection was completed after 65 days of operation. The inspection indicated an average loss of 5/32 in. in the wall thickness of the tubes in the heater. The flash chamber had corroded about $\frac{1}{8}$ in. at this period. After the first inspection a chrome lining was recommended for the flash chamber, the top and bottom necks of the reaction chamber, the bottom of the fractionating tower, where there was also some indication of corrosion.

The second inspection was made 45 days after the first inspection. This time only the tubes were inspected. There was a continuance of severe corrosion, 18 tubes being too thin for further use. It was evident that the unit had to be equipped for protection against corrosion, to prolong the life of the equipment.

A third inspection was completed after 150 days of operation. At this time 37 more tubes were retired from service because they were too thin. As there were not enough tubes in stock, many of the old tubes were reconditioned for further service by removing the corroded ends and welding on stubs. Up to this time three of the wall tubes had been renewed three times. The flash chamber had corroded from 0.81 to 0.50 in. in 5½ months, a total loss of 0.31 in. or 38 per cent. The vapor outlet nozzle had a loss of ½ in. and required replacement. The fractionating column showed a metal loss of 0.17 in. opposite the vapor inlet. All process piping with operating temperatures above 650° F. was very seriously cor-

(Continued on page 73)

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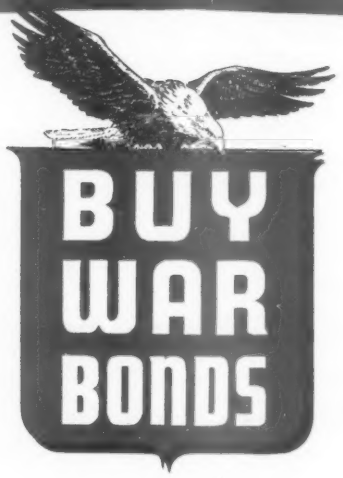

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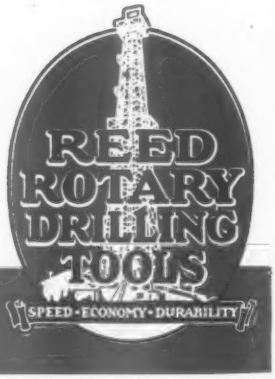

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Horizontal Drilling From Bottom Of Shaft in Pennsylvania Field

As a method of stripping sands in old depleted fields, a group of Pennsylvania operators have undertaken the novel method of sinking a shaft to the shallow pay and of drilling horizontal wells through which the oil can collect by gravity. This operation required the invention of entirely new techniques and safety measures, which are described in this article.

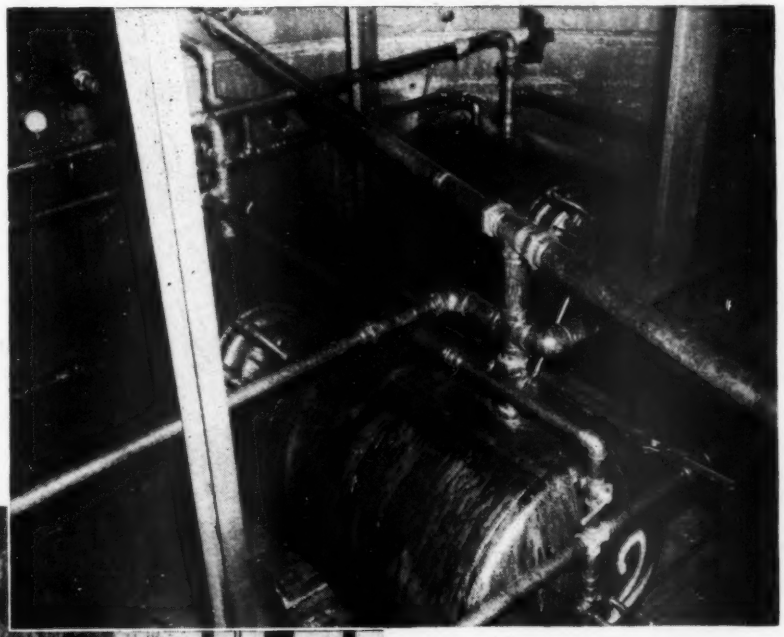
by H. L. Schultheis

OIL CITY, Pa. — A revolutionary drilling practice, one that some believe will play a vital part in the future production of crude oil, is now undergoing its most extensive and practical test in this heart of the Pennsylvania region, cradle of the petroleum industry.

The method involved is that of horizontal drilling, instead of vertical, in which holes are bored directly through the pay sand from the bottom of a minelike shaft dug to the depths of the oil-bearing strata. The holes extend out from the shaft like the spokes of a giant wheel.

The drilling method employed on the project, installed by the Venango Development Corp. and located at Two Mile Run, near Franklin, is that patented by Leo Ranney, who is technical director of the operation. The shaft is located near the center of a 400-acre tract on which are now located 31 stripper wells, producing about one-tenth of a barrel per day each.

From the bottom of the shaft, two of the horizontal wells, drilled on diametrically opposite sides of the work chamber, now extend for about 2,000 ft. each, or a combined distance of about 4,000 ft. in a straight line, through the pay sand, which in this particular area, is the First Venango.



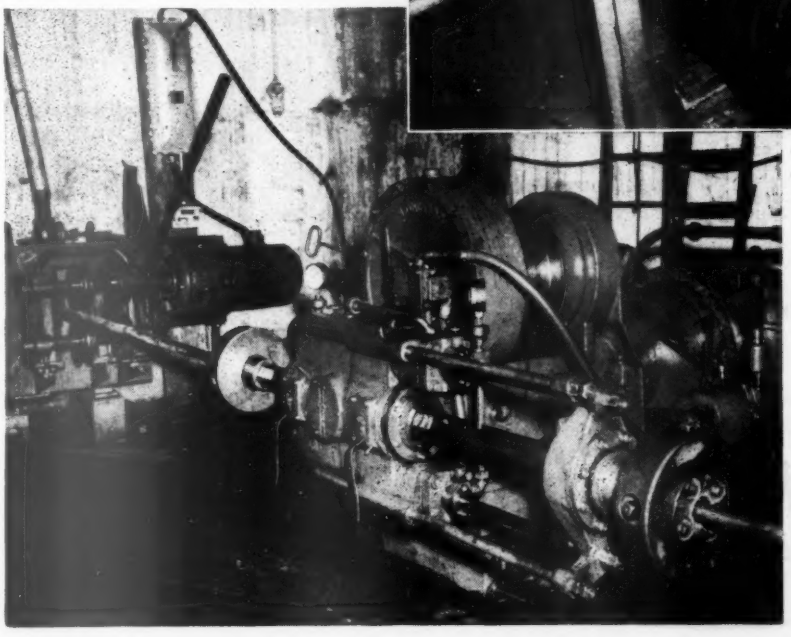


Fig. 1 (left): View in work chamber showing rotary drilling machine of 25 hp., rod puller and drilling rod in operation in No. 1 well

Fig. 2 (above): Two of the three 20-bbl. gathering tanks on bottom of shaft under work chamber. One tank is used for accumulation of oil, other two for water and drill cuttings during drilling operation

Although drilling operations are still in progress on the two holes, which are to be extended to a total length of approximately 2,700 ft. each in order to reach the edge of the tract under development, oil is now being secured by gravity flow. But, as is to be expected, it is admittedly small, since the drill water under 150 lb.

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pressure pushes the oil away from the holes. The exact amount of the oil now being run is not being revealed either by the development corporation or the technical adviser.

For the real productive test will not come until the holes are completed and shot. To date, however, the project is held to have clearly demonstrated the feasibility of the drilling method and soundness of the theory on which the project is based.

The oil mine is located in a small hollow in Sugarcreek Township, Venango County, on property owned by D. W. Grant and his nephew, Dohrman S. Grant. The method of drilling, all of the special machinery, the special diamond drills, the methods and technique used on the project were developed by Mr. Ranney. He applied the process for the first time in a First Cow Run sand project in southeastern Ohio, where it is said the wells have paid for their drilling in the past 3 years.

Depth of Shaft

The shaft has a total depth of 429 ft. to the bottom of the work chamber. The shaft is a monolith of concrete, 14 in. thick. It has an inside diameter of 8 ft. The work chamber at the bottom of the shaft is circular and has an inside diameter of 27 ft. The sides and floor are of steel and concrete, 18 in. thick, while the rafters are of heavy railroad rails with the lower ends buried in rock. The shaft is equipped with an elevator cage that carries the workmen to and from the chamber.

Port holes for 24 wells are cast in the walls around the work chamber, the wells being spaced at regular intervals, so that the holes when drilled will resemble the spokes extending from the hub of a huge wheel.

A rotary drilling machine, equipped with various modifications, is used to drill the horizontal wells which are bored "two at a time" on opposite sides of the work chamber (Fig. 1). While the tools and diamond drill core are being pulled from one well, another set of tools and another core barrel are being run into the opposite well, ready to drill in that direction. The drill rods are not uncoupled until both wells are completed. Tools are moved from one well into the other at a speed of 133 ft. per minute.

The first pair of opposite wells, each of which has now been drilled about 2,000 ft. into the sand, are 5 in. in diameter for the first 100 ft. and are cased with 3½-in. casing for that distance. From the ends of the cased holes, 3-in. diamond drill holes have been extended into the sand. These will not be cased.

The most intricate feature of the horizontal drilling operation is to determine the elevation of the holes at any length, then to overcome the force of gravity and follow a predetermined course. At 1,500 ft. the holes are said to be practically level with the well mouth. From that distance to the end they slant upward.

On the bottom of the shaft, 20 ft. under the floor of the work chamber, are three 20-bbl. pressure tanks, (Fig. 2), into which flow the oil, water and drill cuttings from the wells. Oil produced is accumulated in one of these tanks during the drilling operation and water and drill cuttings in the other two. Lifting the drill water, oil and cuttings, sometimes as much as 200 bbl. a day, involves special methods.

Air Pressure Elevates Material

Because of the diamond drill cuttings, an ordinary pump would be worn out in a few days, so air pressure is used to elevate the materials. When a tank is filled, and workmen learn of this fact through an automatic bell system, air under 90 lb. of pressure is turned into the top of the tank and the fluid is forced to another tank in a way station 215 ft. above. From this tank the fluid is blown to the flow tank on the surface. This operation is accomplished by the turning of a valve by a workman in the power house, automatically warned of the coming fluid. In the surface flow tank, oil, water and cuttings are separated by gravity.

Every possible provision for safety of the workmen in the 27-ft. chamber has been taken. A steel ladder leads to the surface. Each drilling well is provided with a strong suction from the ventilator fan, so that if gas is encountered it will be pulled directly

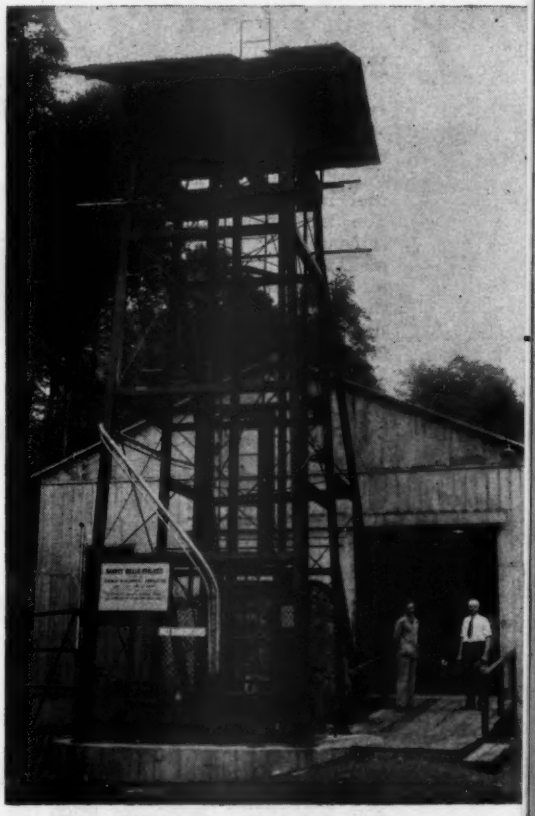

Fig. 4: View of surface structures, showing 26-ft. steel headframe over shaft, and power house. Mr. Ranney, right, and Mr. Fairbank, left, in doorway

to the surface without entering the work chamber. All oil flows into an enclosed tank. Mechanical gas detectors are used at regular intervals for tests, and, in addition, a miner's safety lamp is kept burning in the work chamber at all times. Ventilation is provided through a 15-in. updraft pipe in the shaft wall, and the air in the work chamber is completely changed every 4½ minutes by use of an exhaust fan on the surface. To date the gas content of the subsurface air has never reached 0.1 per cent.

The drilling machine is operated by a 25-hp. explosionproof motor, while

(Continued on page 64)

Fig. 3: Core sections from test holes stored in rack

Front Lines in

REFINING

by Arch L. Foster

How Air Battles Are Won

THE Cooperative Research Council, 12 good men and true, may well be called the conning tower force of the aviation-fuel industry—the motor-fuel industry, too, for that matter. Too hard-driven to have time for self-publicity, studying every possible means for making the props on our air-fleet ships take their loads and their pilots "upstairs" faster and safer than they did yesterday—few people outside their immediate group with whom they work know anything much about what they are doing. But what they help to make possible is one of the two primary reasons why Messerschmitts are not bosses of the air any more. The other reason is the engines and ships in which aviation fuel is burned, fuel tailor-made under these mens' directions.

Refining technologists know of them and of their work; few others do, even men well acquainted with the petroleum and aviation industries look blank when C.R.C. is mentioned. Briefly six men are appointed by the Society of Automotive Engineers, six by the American Petroleum Institute and these constitute the council. Originally this group was organized as a liaison group, to advise the oil and automotive industries each of what the other was doing and planned to do. Its efforts were directed first to the study of motor fuels and their qualities, especially antiknock, its testing and the control of fuel quality. Gradually the scope of work was expanded until aviation-fuel, motor-fuel, diesel-fuel research in all ramifications are included. From an incidental line of endeavor the C.R.C has grown to include about 150 groups and directs a large proportion of the work of more than a thousand technologists and their aides.

Correlate Field Research

Each working group is assigned a specific project on one particular phase of fuel technology; each working group operates as a unit, carrying out research and experimental work on its project, meeting frequently to review results, chart the next step in the course, skeptical of results until proved beyond reasonable doubt, always pushing into the unknown. In such work the course can be plotted for only a short distance, stopping frequently to plot it further step by step.

The work of these groups is supervised, correlated, directed by the council, working through division chairmen. The entire job is actually directed through C. B. Veal, erstwhile research chief for the Society of Automotive Engineers, whose knowledge of the automotive, aviation and petroleum fuel industries' technological branches is doubtless greater than that of any living man. As secretary of the council he is responsible for directing and routing all the multitudinous projects and the liaison between the groups, assembling data, counseling on all the innumerable questions which come up perennially, managing the intricate affairs of the council's work. It is an extremely difficult and involved job, demanding his almost infinitely detailed knowledge of the present and past work of the council—which earlier was called the Cooperative Fuel Research Committee—a thorough fundamental grounding in the technical phases of the work, long practical experience as an engineer in automotive and other internal-combustion engines and their fuels, and the strong confidence of his associates.

Big Men Do Big Jobs

HEARTENING indeed is the advance information regarding the purposes and future work of the Patent Planning Commission, first report of which was made public recently. The first report included some very far-reaching recommendations to the United States Government regarding what many have considered reasonable, safe and progressive revisions of our patent system. Bills to enact some at least of these recommendations into law will doubtless be introduced in Congress this session.

Two tasks remain for these men, each a strong and responsible leader in his field. The second and in their opinion the smaller job is to decide what they believe should be the Government's policy regarding patents owned by it, and its relations with its employes who discover inventions. Some believe that the Government should divest itself of all patent ownership, that such ownership smacks all too much of the totalitarianism which is attempting with remarkable success to direct and control all activity of the human race in this hitherto most fortunate nation. Capable opinion is among many big-time men that this problem should be answered; even the president included this question among the Tasks of Hercules assigned to this commission.

If Government-owned patents are to be retained by our Government, it is widely believed that, instead of the nonexclusive licenses now granted or grantable under them and which generally have evoked little if any interest among commercial and industrial men because of the overbalancing disadvantage of practically unlimited competition so made possible, only exclusive licenses should be granted on any patent in which industry may be interested. In recent years minions of the "Down with Private Industry" wing of politics have accused industrial organizations of freezing patents to protect some other invention to keep their inventions from being supplied to the populace. Unfortunately for this demagogic claim the U. S. Government has been singularly guilty of this "crime" to a greater extent than any other organization known!

Most Fundamental Problem

The third and by far the most fundamental of the three tasks is that of determining and recommending ways and means whereby research and industry may be stimulated, to improve and increase the output of industry and to improve employment, increase the welfare of the nation. Such a problem constitutes one of the most vitally fundamental functions of the people of these United States, a job to challenge the minds and ingenuity of any group of men, however capable. On the results of it can depend, in large degree, at least, the impetus behind the postwar advance of industry and the American peoples' welfare. An impoverished people is generally a servile people; witness the Near East in modern times.

Such a task could never be concluded, nor does this commission expect to complete it. It is understood from excellent sources that the hope is held by the commission that a report on this third and big problem will be forthcoming by the end of the war, in which far-reaching and important recommendations will be made, but not final recommendations. Those may come only with the growth-stopping of the race.

We believe they'll get the job done.

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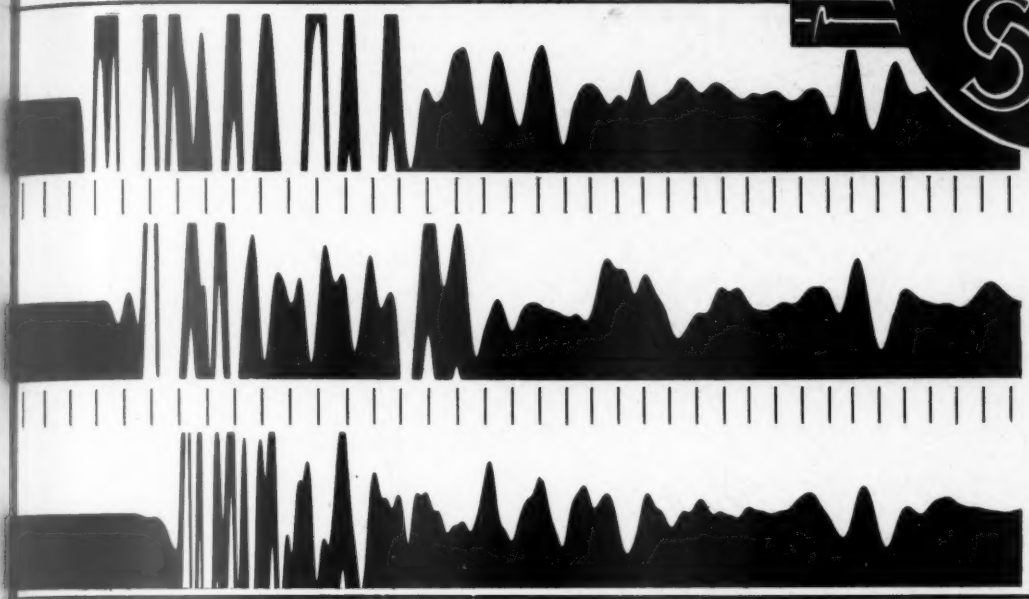
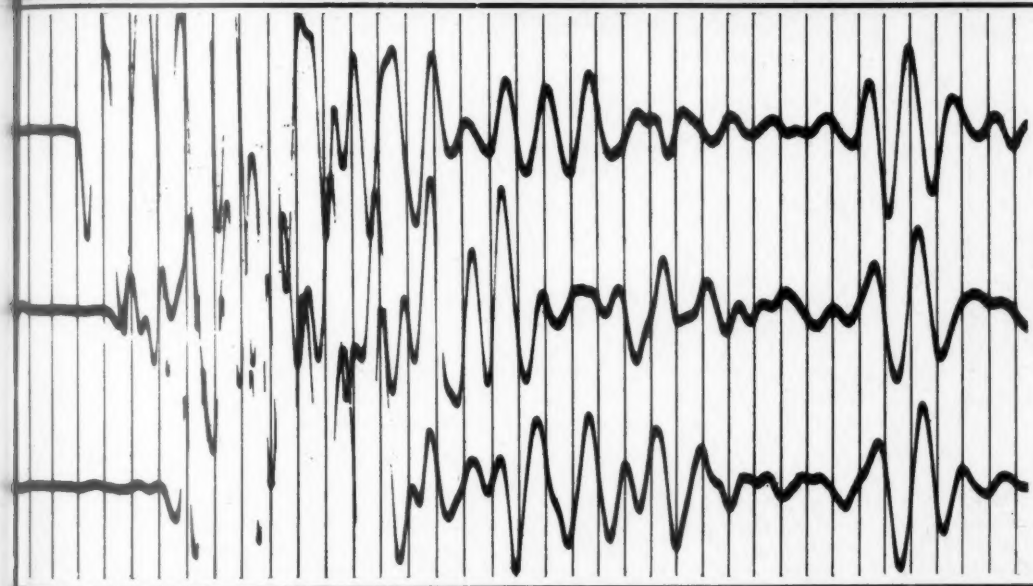


Variable area field record obtained with S S C wide frequency range *Earth Motion Recorder.*



A recording of the above *Earth Motion Record* through standard S S C seismic equipment.

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Oligocene

WASH.
SWEETGRASS ARCH
MONT.
N.DAK.
WILLISTON BASIN
P.R.E. CAMBRIAN SHIELD
LEWIS OVERTHRUST
COLUMBIA PLATEAU
BLUE MTS.
ORE.
S.DAK.
WYO.
POWDER RIVER BASIN
BLACK HILLS UPLIFT
SIOUX UPLIFT
MINN.
MICH.
MICHIGAN BASIN
N.Y.
ADIRONDACK MTS.
VT.
N.H.
ME.
CONN. R.I.
MASS.
CALIF.
IDAHO
SNAKE RIVER PLAIN
NEV.
IOWA
WIS.
ILL.
PENN.
NEB.
CAMBRIDGE - STOCKTON ARCH
GREEN RIVER BASIN
FOREST CITY BASIN
OHIO
N.J.
MD.
DEL.
SIERRA NEVADA
GREAT BASIN
COLO.
DENVER BASIN
LINCOLN UPLIFT
ILLINOIS BASIN
IND.
CINCINNATI DOME
W.VA.
ALLEGHANY PLATEAU
VA.
UINTA BASIN
SALINA BASIN
NEMAHA RIDGE
UTAH
COLORADO PLATEAU
MO.
KY.
OZARK DOME
ARK.
TENN.
NASHVILLE DOME
APPALACHIAN MTS.
PIEDMONT PLATEAU
N.C.
S.C.
ATLANTIC COASTAL PLAIN
GREAT VALLEY
SANTA BBS
ARIZ.
BLACK MESA BASIN
SAN JUAN BASIN
DODGE CITY BASIN
KANS.
OKLA.
LAS ANIMAS UPLIFT
AMARILLO MTS.
ANADARKO BASIN
ARKANSAS VALLEY
MISS.
WICHITA MTS.
ARBUCKLE MTS.
OUACHITA MTS.
EMBAYMENT
WARRIOR BASIN
N.MEX.
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GA.
EAST TEXAS BASIN
CENTRAL MINERAL REGION
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FLA.
MARATHON MTS.
BALCONES MEDIAN FAULT ZONE
RIO GRANDE
EXPLANATION
OUTCROP
OLDER FORMATIONS EXPOSED
BASIN
UPLIFT
STRUCTURAL AXIS
INTRUSIVE ROCK
OIL FIELD PRODUCING FROM MAPPED SYSTEM
FAVORABLE AREA FOR OIL AND GAS PROSPECTING IN MAPPED SYSTEM
LESS FAVORABLE AREA FOR OIL AND GAS PROSPECTING IN MAPPED SYSTEM
UNFAVORABLE AREA FOR OIL AND GAS PROSPECTING IN MAPPED SYSTEM
APPROXIMATE DEPTH OF TOP OF MAPPED SYSTEM (IN THOUSANDS OF FEET)

OIL ZONES OF THE UNITED STATES

Oligocene

(Compiled by The Oil and Gas Journal)

PRINCIPAL PRODUCING HORIZONS:

Sands: Numerous sands in the Vicksburg and Frio, Marginulina, Heterostegina and Discorbis zones in the Gulf Coast area; Sespe in the Santa Barbara and Ventura-Newhall sectors of the coastal district of California.

DISTRIBUTION OF PRODUCING AREAS: One of the most difficult problems of the Oligocene on the Gulf Coast is its correlation Some authorities particularly in Louisiana place the Discorbis zone in the lower Miocene while in South Texas, some geologists place the Catahoula in the Oligocene. In this discussion the boundary between the Oligocene and the Miocene is placed at the base of the Catahoula and the top of the Discorbis nomada zone. The Oligocene is generally nonmarine on outcrop in Louisiana and Texas, although in the eastern part of the area marine **Vicksburg** marls are found at the surface. The Vicksburg forms the lowest group in the Oligocene and becomes progressively more sandy to the west, forming a number of important pays in the lower Gulf Coast and South Texas districts. It produces in the deep pay at Thompson and Pierce Junction but is not otherwise important in the upper Gulf Coast district. The most important Vicksburg production comes from a belt extending through Jim Wells, Brooks and Hidalgo counties in South Texas, where one or more Vicksburg pays underlie a series of pays in the Frio.

The main belt of Frio production lies above the Vicksburg in this belt and extends to the coast, forming the sole reservoirs in some fields and underlying **Marginulina** and higher pays nearer the coast. The Frio is the most important producing zone in fields such as Saxet, Refugio and Tom O'Connor as well as in the active Jackson County district and the old salt dome fields to the Louisiana State line. Here it ceases to be an important producer.

The upper Oligocene, including the Marginulina, **Heterostegina** and **Discorbis** pays is of variable importance in the Gulf Coast area. The lowest pay, the Marginulina produces at Flour Bluff and other fields along the coast and the belt containing pays of this age is broadest at the vicinity of Jackson County. Marginulina production extends into Louisiana at Jennings and Bosco. Here the upper Oligocene belt leaves the coast and in eastern Louisiana extends to the north from Lake Pontchartrain.

The Heterostegina pays are more scattered than the Marginulina sands and are not as important. They have not been reported south of Nueces County, but produce from a number of fields in the Saxet area, and in a few localities in Refugio and Victoria counties. In Louisiana, the Heterostegina produces from several pools in Jefferson Davis and Acadia parishes. The Discorbis group is unimportant in Texas but produces in a few Louisiana fields, including Chalkley and Bosco.

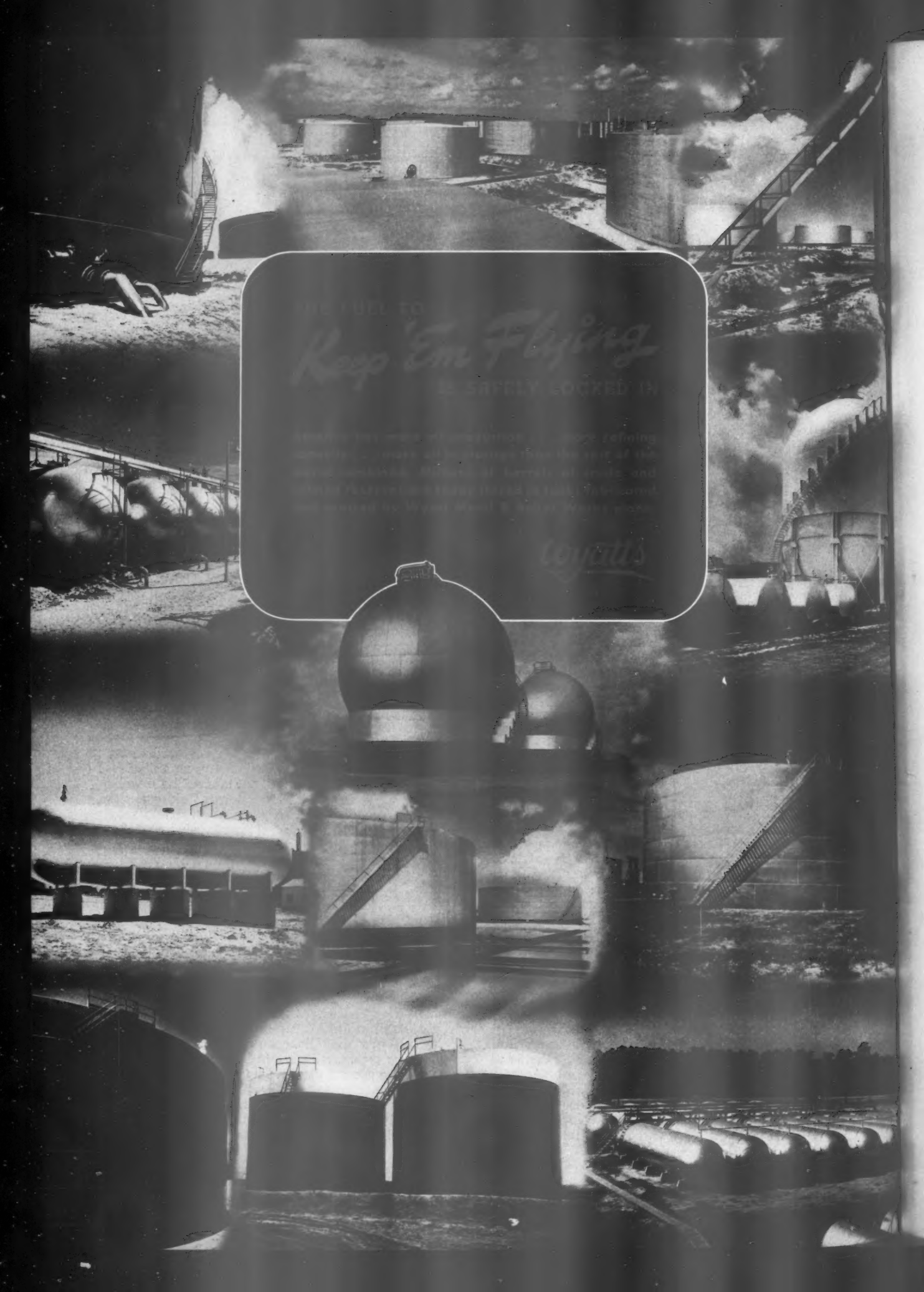
The Oligocene of California is considered by some authors to include the Kreyenhagen shales in the San Joaquin Valley. Others place this formation in the Eocene. In any event, there appears to be little possibility of finding much Oligocene oil in this district as the Kreyenhagen has not been found productive.

The **Sespe,** of Oligocene age, produces in the Ventura-Newhall and Santa Barbara districts forming the lowest pays at Capitan and Elwood as well as the principal pay in several fields in eastern Ventura County. Generally, fields producing from higher formations in this area have not been drilled into the Oligocene so that it can be considered a potential reservoir over the whole of the coastal district. On the other hand, in the Los Angeles Basin wells on structure have passed through the Miocene and have found the Sespe either barren or missing at Richfield, Dominguez, Torrance and other fields. Possibility for wedge-edge production on the flanks of schist highs is, however, present.

EXTENSION INTO OTHER AREAS: Any well along the Gulf Coast which has the Eocene as an objective, obviously tests the Oligocene, but to date these wells have generally found the formation too close to the outcrop to produce. The producing Oligocene may be compared with a series of overlapping shingles with the best pays in the Vicksburg to the southwest and the Discorbis pay to the northeast. What happens farther east is still unknown. Oligocene production may die out altogether at the Mississippi River or it may descend again step-like toward the east with lower formations producing in Florida.

Gulfward, so many sands come into the known section, forming productive wedge edges that pays may be found at almost any depth in the Oligocene, at least until the section has become completely shaly. This group has not been tested at all along the Louisiana Gulf Coast where wells over 13,000 ft. deep are still in the Miocene.

In California, the Oligocene appears to have good chances for production only in the embayments and basins in the coastal district. The thick marine section in similar embayments in Oregon and Washington makes this group an objective in these areas which are the only ones in the United States underlain by Tertiary rocks which are still untested.



Reasons and Methods for Perforating Tubing

by Harry F. Simons

A mechanical tubing perforator has been devised which can punch holes in tubing while in the hole. The uses to which this tool can be put and its methods of operation are discussed in this article.

PERFORATING of tubing while it is in the well is an innovation of the past several years when tools became available to perform this type job and it became apparent that a small hole in the tubing at the appropriate point, or points, would solve some production problems. The principal reasons for perforating the tubing are: (1) To assist flow, particularly in gas-lift operations; (2) to provide a means of circulating through the tubing, and (3) as an aid in pulling a packer.

With reference to the first reason given above, it is a common practice in gas-lift operation to drill a hole in the tubing at a selected spot as an aid in kicking the oil upward through the tubing. This is done when the tubing is run in the hole. If an additional perforation is later needed, perforating the tubing in place in the well is much more economical than pulling the tubing from the well, drilling a hole in it at the proper point and then rerunning it.

At the present time there are two principal methods of perforating the tubing while it is in the well. One method is to use a mechanical perforator recently introduced and the other is to use a gun perforator. A 1¾-in. gun perforator which will run inside 2-in. tubing is available and with it a bullet as small as 1/32-in. or as large as 15/32-in. can be shot; most commonly a ⅛-in. bullet is used. As the operation and application of the gun perforator is well understood, it will not be further discussed here.

Use of Orifice Insert

The mechanical tubing perforator is run inside the tubing on a single-strand 0.082-in. diameter wire line. With it, it is possible to put a selected-size (from 1/64 to 5/16-in.) hole in the tubing. For sizes up to and including ⅛-in., an orifice insert, which is a tapered cone with a hole drilled along the axis, is driven into and through the tubing wall. The outer diameter of this cone is approximately 5/16 in.

The tool for driving the insert or punching the hole through the tubing wall is simply but ruggedly constructed. Essentially it consists of two parts, a stationary one in which there is a driving head, or a hinged upright arm, which holds the orifice insert, and a movable wedge-shaped mandrel. Driving downward on the mandrel forces the insert, or the punch, outward and into the tubing wall.

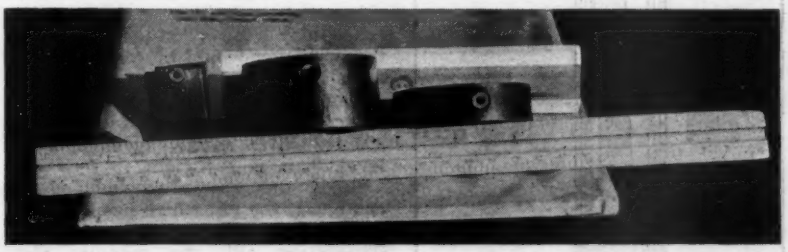
Below the tool there is a double knuckle joint and a stop, the latter being similar to an inverted bulldog spear or an inverted choke mandrel and slips. The stationary part of the tool is attached to the stop and is held in place by it.

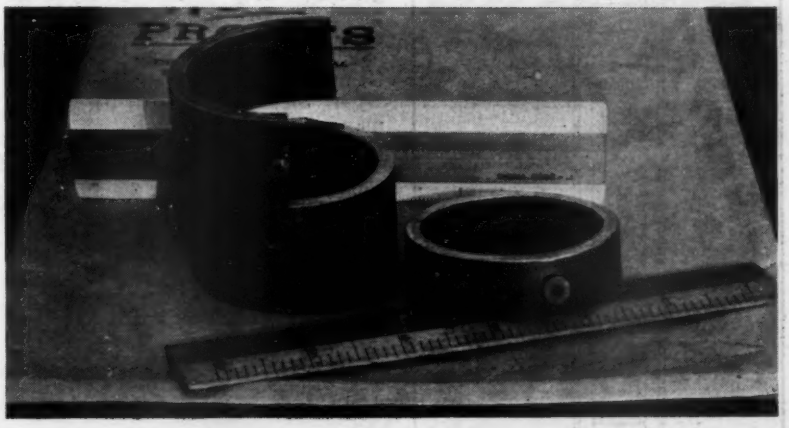
A shear pin in the collar which holds the upper or movable member to the lower and stationary member allows the tool to be run into the tubing and the stop set. It is then sheared and the wedge driven downward to force the driving head outward.

Above the tool itself a set of 1½-in. jars with a 20-in. stroke and a 5-ft. stem 1½ in. in diameter and a wire line socket are used. These provide the necessary weight to drive the wedge downward.

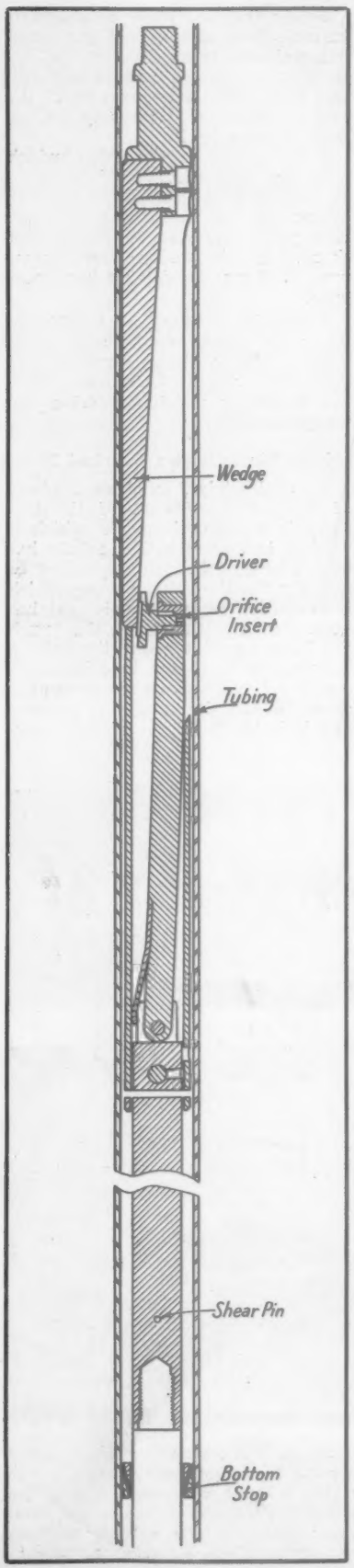
Shear Pin Indicates Punched Hole

Approximately 2 in. above the base of the stationary part of the tool there is a ⅛-in. shear pin which is used to indicate whether a hole has been punched through the tubing or not. By the time the housing which is part of the movable element has been driven to this point, the punch has been forced through the tubing. This assurance that a hole has been punched is needed when the annular space behind the tubing is plugged and it is impossible to establish circulation through the hole. The pin's





Views of samples cut from tubing strings after having been perforated with mechanical device. At top is vertical cut through sample to orifice insert, large coupon has a 5/16-in. hole punched in it and small coupon has a ⅛-in. orifice insert through it. Note that the orifice insert projects lightly beyond the outer circumference of the tubing. The inside end of the insert is in a slightly recessed position which allows the metal to flow back and grip it to prevent its coming out. The insert can be driven out only with difficulty



Schematic drawing showing mechanical tubing perforator in position to drive orifice insert through tubing wall

having been sheared shows that a hole has been punched.

Numerous tests made with the tool show that it is necessary to hit 41 blows with the jars to drive the insert or punch through the tubing. When the tool is run in a well, this number of strokes is used and then an additional 25 strokes employed just to insure that the punch or the insert has been driven through the tubing. Jarring upward then frees the stop and the tool can be pulled from the hole.

The tool can punch one hole or drive one insert each time it is run in the hole. Generally it takes about 3½ hours to rig up the equipment, assemble the jars, stem and tool, install the lubricator, run in, punch the hole or drive the insert, come out of the hole and dismantle the equipment. Generally one hole is all that is needed but as many as four holes have been punched in a 6,000-ft. string of tubing. When running in and pulling the tool a line speed of less than 200 ft. per minute is used. This is because the tool is run and pulled under pressure and a greater speed would be hazardous.

Reasons for Perforating

Where the perforation is used for assisting flow the object is to admit gas from the annular space to the tubing at the proper point. Either accumulated gas, or gas from an outside source supplied to the annular space, may be used. In the latter case the operation would be considered as a gas lift.

Generally, when using an outside source of gas, the tubing is perforated 300 to 400 ft. above the static fluid level. This is sufficient to flow the well if the gas pressure is high enough. If the gas which has accumulated in the annulus is to be used as the lifting aid, the pressure will generally drop when the hole is punched above the static fluid level. A second perforation 200 to 1,000 ft. below the static fluid level will then be needed to keep the well flowing. Where the well has a low pressure it may be necessary to put several perforations in the tubing so that there will be several stations at which gas can enter to help boost the oil to the surface. This was the condition in the well where four perforations were inserted.

Quite frequently on gas-lift wells a slight boost near the surface is required to get the oil out of the tubing at a satisfactory rate. A pressure of 100 lb. will lift over a 300-ft. column of oil and by perforating at that depth under the surface a more satisfactory operation is obtained.

The presence of the small orifices in the tubing has no bad effects. If the perforations are too low, the orifices remain covered with fluid. If they are not needed and are above the fluid level, only a slight amount of oil could escape from the tubing into the annual space and this is only possible in cases where the pressure in the annulus is less than that in the tubing.

Establishing Circulation

There are several reasons for wishing to circulate either out or in through the tubing. One of the most common is when it is necessary to kill the well so that it can be worked on. In many cases the pressure on the well is too great to risk pulling the tubing under pressure and in others the well heads are such that pressure-control equipment cannot be installed without first killing the well. Another condition is when the bottom of the tubing has become plugged so that the oil cannot rise in it, in which case punching a hole above the plug would permit continued production without pulling the tubing from the well.

In either of the above cases as large a hole as possible would be desired and instead of driving the insert with a small orifice through the tubing a ⅜-in. hole would be punched. Several holes may be desired in which case spacers would be added to the stop part of the tool so it could be set at the same depth each time but would punch a hole above the one previously made. Generally these spacers are 3 in. in length so a succession of holes, 3 in. apart, can be driven through the tubing.

Pulling Packers

One of the most frequent needs for perforating the tubing is in connection with the pulling of packers. Quite often the packers are stuck or can be pulled with extreme difficulty. One reason for a packer's appearing to be stuck is the pressure above it expanding the rubber and holding it tightly against the pipe. If the packer can be pulled at all, it will mean swabbing the fluid out of the hole as the packer is lifted.

Sometimes the packer is stuck due to an accumulation of material above it and it is necessary to remove this debris before the packer can be pulled. Perforating above the packer and then circulating fluid will wash the material out and free the packer.

However, most packers are freed by simply equalizing the pressures on both sides of the rubber, which removes the load from it. This can be done quickly with the mechanical or gun perforator and if any trouble in pulling the packer is anticipated, many companies arrange for the perforation before starting work.

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OPERATING IDEAS

Boats for Moving Material

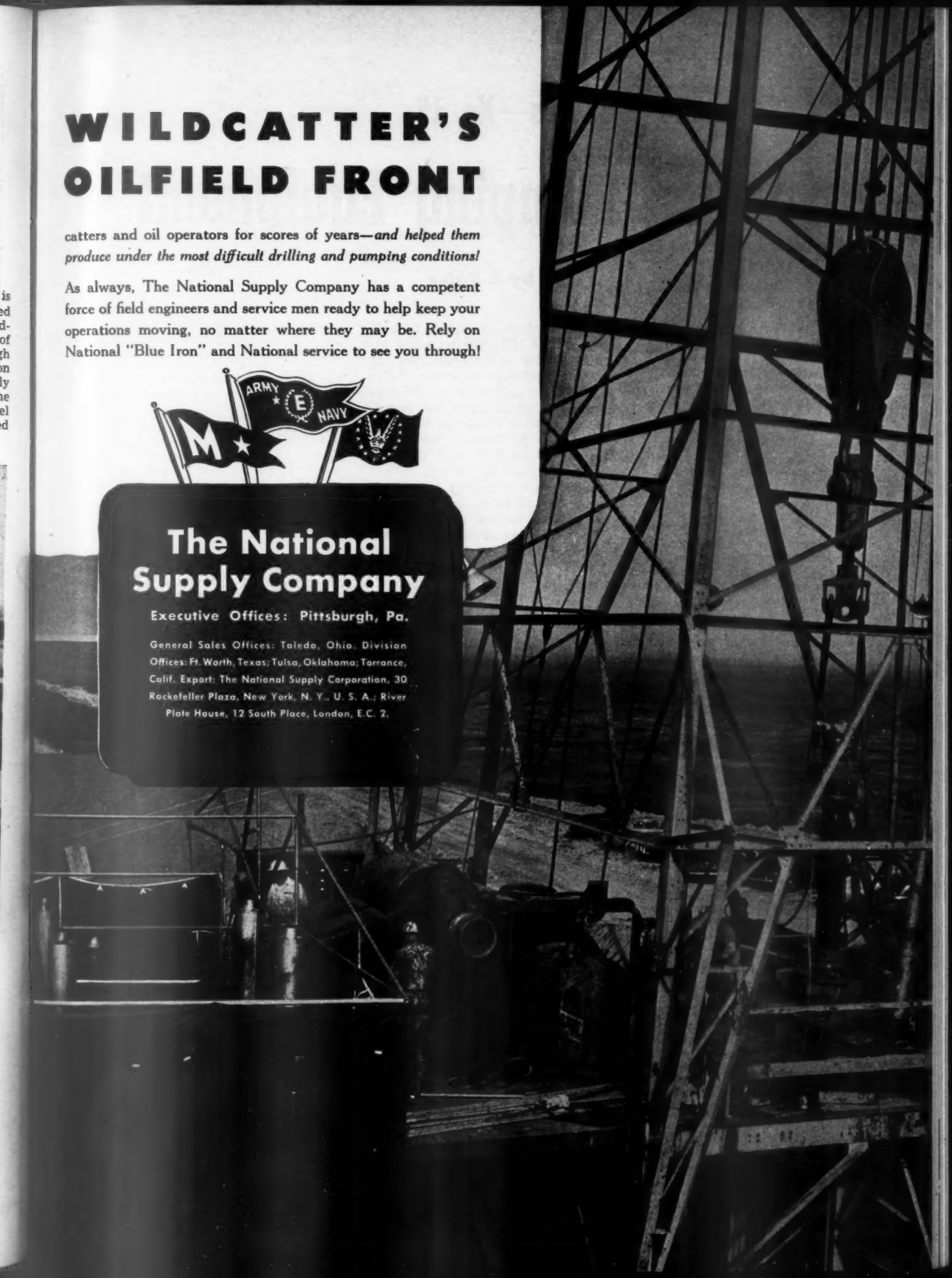
MOVING of the small heavy items of equipment incidental to the operation of a rotary-drilling rig is no problem to this crew. The large boats shown can be used for the storage and transport of subs, floats, bits, pump liners, tong heads, slips, overshots, chain, pipe, fittings, connections and valves, etc. Separate compartments are provided for each item, thus simplifying inventories and searches for some particular part or piece of equipment. The boats are over-the-road width and are transported by truck and trailer. The heavy post between the two boats serves as an anchor for a trolley line which can be used for handling heavier items stored in the boats as well as for laying down drill pipe.

← Ladder on Fuel Tank

AN ever-present concern to the drilling crew is the supply of fuel and generally tanks are gaged when coming on and going off tour. This small ladder, hooked over the end of the skid mounting of the fuel tank, permits access to the opening through which the tank is gaged and filled. The foundation for the fuel tank has channel irons on top properly spaced to fit the tank skids. In case of necessity, the tank can be loaded on a truck and used to haul fuel to the location. Two such tanks can thus be used to maintain the fuel supply.

↑ Frame Protects Light Plant From Damage in Moving

THE small motor-driven electrical generators used to supply current for drilling-rig lights are always in danger of damage, particularly when moving. A simple frame made from tubular steel and sheet metal protects this one. An inverted V of old sucker rod, welded to the top members, permits easy attachment of the winch line for loading or handling. The gasoline tank is welded to the under side of the top members of the frame.



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Oil-Well Pumping Practices—No. 15

Surface Pumping Equipment

by J. Zaba

In his analysis of surface pumping equipment, Mr. Zaba begins with a discussion of the equipment from beam hanger to the crank. Following this he will take up the transmission and reduction unit and the prime mover. Although this series began in the issue of July 1, it is so organized that each section is a unit in itself which may be read without the necessity of referring back to previous installments or of waiting for the next one. It is, thus, a series of separate articles dealing with the most important phase of oil production and arraged in a logical sequence.

A MODERN surface unit pumping equipment, from beam hanger to prime mover, is, mechanically, a highly efficient installation. In any unit, designed by a reliable manufacturer, careful consideration has been given to mechanical details of construction, such as distribution of stresses in structural members, sizes of bearings, gear-tooth profiles and hardnesses, strengths of shafts, etc. An average operator purchasing a pumping unit is interested primarily in two facts. The first of these two facts is selection of equipment of proper capacity for the given present, and expected future, set of pumping conditions. The second fact is sufficient knowledge of the built-in characteristics of the equipment, so that these characteristics may be utilized to assure long and trouble-free operating life of the installation.

The prerequisite for selection of equipment of proper capacity is not only the knowledge of the pumping conditions expected, but also uniform rating of the surface pumping equipment. In the past there has been considerable confusion in regard to rating of this equipment, leading quite often to misunderstanding of specifications with the resulting over or underequipping of wells. Through the combined efforts of the different standardization committees of the American Petroleum Institute, of the oil-producing companies and of the manufacturers of the pumping equipment, standards for uniform methods of rating have been worked out. These methods will be given later in this series upon conclusion of general discussion of the surface pumping equipment.

As previously stated, the mechanical details of a unit pumping installation are primarily within the province of the designer. For the purpose of this series, the equipment will be discussed from the standpoint of the operator. That means that only these data and characteristics will be considered which contribute toward better understanding of the operation of the equipment and are useful in securing more efficient methods of application of the installation.

While for the purpose of calculations leading toward selection of a pumping installation, the whole surface pumping equipment, from beam hanger to prime mover, has to be considered as a unit, in the discussion which follows, this equipment will be divided into three groups: (1) equipment from beam hanger to the crank, (2) transmission and reduction unit, and (3) prime mover.

Equipment from the beam hanger to the crank changes the rotation motion of the crank to the reciprocating motion of the polished rod. Beginning with the well side of the installation the equipment consists of beam hanger, walking beam, samson post, pitman assembly, counterbalance weights, whether beam or rotary, and all necessary bearings. Theoretical considerations and actual tests conducted on the behavior of this equipment indicate that manner of arrangement and direction of rotation are a factor in efficient operation of the whole installation.

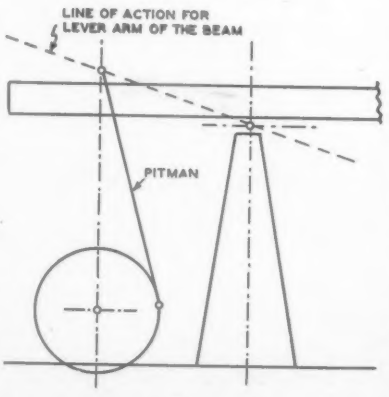

Fig. 1

Pitman Pull

In case of an ordinary beam setup, the pitman-stirrup bearing is above the beam and not in horizontal line with the samson-post bearing for the horizontal position of the beam. The result of such an arrangement, shown in Fig. 1, is that the direction of force applied through pitman deviates considerably from the true right-angle pull on the arm of leverage of the walking beam. The right-angle pull is of course the most efficient application of force since the whole force is utilized for performance of work. In case of deviation from the vertical pull, the pulling force must be broken up into two components, of which only one, that is the one vertical to the lever arm of the beam, performs actual work. The component parallel to the lever arm sets up stresses in the pumping structure (Fig. 2). For the ordinary beam setup and for closewise rotation this deviation, varying with different position of the crank, reaches its maximum during the upstroke. To illustrate the result of these conditions, curve shown in Fig. 3 has been prepared. This curve shows the magni-

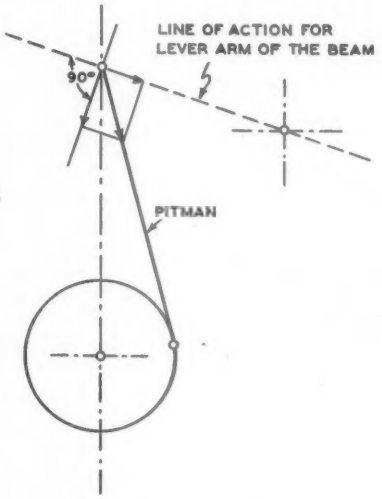

Fig. 2

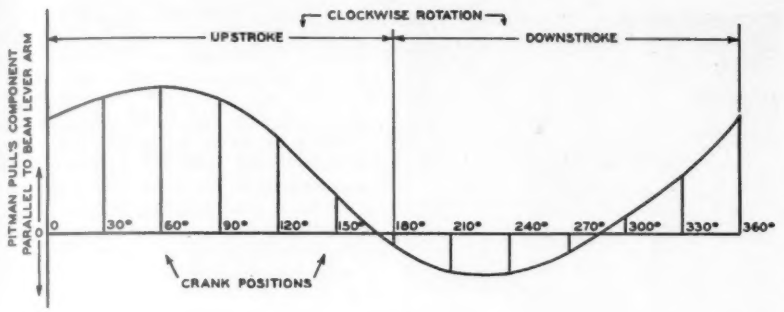

Fig. 3

tude, for different positions of the crank, of the component of the pitman pull parallel to the lever arm of the beam. Since, as previously stated, this component of the pitman pull does not contribute anything to the actual work of lifting the fluid, the magnitude of this component force is the measure of the efficiency of utilization of the force acting through the pitman.

The curve has been prepared for an assumed beam and pitman assembly with a specific set of dimensions. The curve shows that the component parallel to the lever arm of the beam reaches its maximum during the upstroke. The peak during the downstroke is much smaller than that during the upstroke. That means that during the upstroke, which is the actual working part of the cycle the deviation from the right-angle pull is at its maximum, which results in decrease of effectiveness of the pitman pull. The true right-angle pull is attained at two points, where the component horizontal to the lever arm of the beam equals zero. In operating a pumping unit, several arrangements are used to reduce the deviation, from the true right-angle pull, of the force acting through the pitman.

Counterclockwise Rotation

Closer investigation of Fig. 1 suggests that for ordinary rig setup, with crank under the upper pitman bearing, counterclockwise rotation should produce, during the upstroke, less deviation from true right-angle pull than the clockwise rotation. This is illustrated by curve shown in Fig. 3. For the counterclockwise rotation this curve has to be read from right to left, therefore the peak deviation from the right-angle pull occurs during the downstroke. This should result in less counterbalance required, lower power consumption, lower power peaks, less stresses on rods and surface equipment.

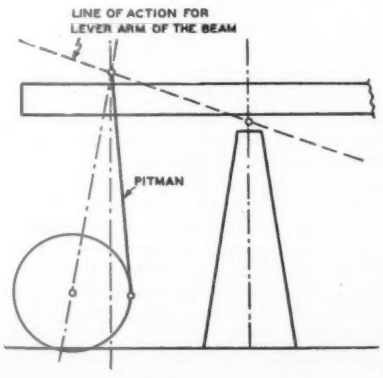

Fig. 4

Crank Setback Arrangement

Another arrangement for reducing the deviation from right-angle pull is setting back of the crank as shown in Fig. 4. The position of setback may vary. From inspection of schematic drawing of Fig. 4 it is apparent that with this arrangement there should be less difference in deviation from right-angle pull between the upstroke and the downstroke. If a curve, similar to that shown in Fig. 3 was constructed for this arrangement it would show that this is actually the case. Consequently, for this arrangement, there is little difference, from the standpoint of deviation from right-angle pull, between the clockwise and counterclockwise rotation.

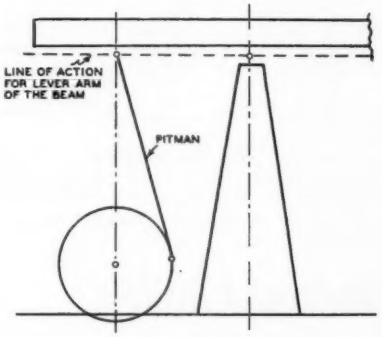

Fig. 5

Centerline Arrangement

The third arrangement is that in which the beam is used with the upper pitman bearing and the samson-post bearing in line for the horizontal position of the beam (Fig. 5). The crank is in position of an ordinary rig setup. Inspection of this rig setup reveals that again, as in the case of a crank setback arrangement, there should be little difference between degree of deviation from right-angle pull during the upstroke and the downstroke.

Tests of Different Rig Setups

Actual tests have been performed about 12 years ago[1] to determine the validity of theoretical considerations in regard to these three rig arrangements. The results obtained can be summarized as follows:

In comparing clockwise and counterclockwise rotation for the usual rig set up it has been found that counterclockwise rotation resulted in lower power consumption and lower peaks, higher over-all rig efficiency and lower rod and rig stresses than clockwise rotation. The setback position with clockwise rotation when compared with usual setup with counterclockwise rotation gave shorter polished-rod travel with slightly less fluid produced and with corresponding decrease in power. Power peaks were reduced considerably but the over-all rig efficiency was also decreased. Motor-speed variations and rod stresses were increased. Use of beam with upper pitman bearing and samson-post bearing in line parallel to the beam resulted in effects on power and efficiency very similar to those secured through counterclockwise rotation with usual rig setup.

More recently results of other tests were published[2] on effect of the three different rig setups on efficiency of the installation. These results indicate that beam with upper pitman bearing in line with samson-post bearing gave most satisfactory results from the standpoint of power cost per barrel, power peaks, and over-all efficiency.

During all these tests counterclockwise direction of rotation was employed.

Other Factors

Efficient arrangement and utilization of the geometry of the part of the surface equipment from beam hanger to the crank is of course only one part of providing for satisfactory operation of the installation. The other part consists of special care of eliminating all factors which may lead to the failure. Overloading is a most apparent potential cause of failure. The question of beam capacity of pumping units will be discussed in installment dealing with rating of pumping units. Other possible causes can be eliminated simply by good operating practices. Among the practices, those dealing with proper installation of the unit are of primary importance. Failure to align the unit properly in regard to centerline of the well may impose stresses on beam and samson post for which they were not designed.[3] Failure to provide proper foundation will eventually

also create conditions for which the unit was not designed.

Pitman Length Effect

The discussion of the equipment from beam hanger to the crank would not be complete without mentioning briefly the effect of the length of the pitman. Because of pitman's angularity the motion of the polished rod, for uniform speed of rotation of the crank, is not a simple harmonic motion and the velocity of the polished rod is different for the part of the cycle from the midstroke down and return from the part of the cycle from the midstroke up and return. For an infinitely long pitman conditions of simple harmonic motion could be approached. From the standpoint of uniformity in polished-rod travel therefore a pitman as long as permitted by other factors is desirable.

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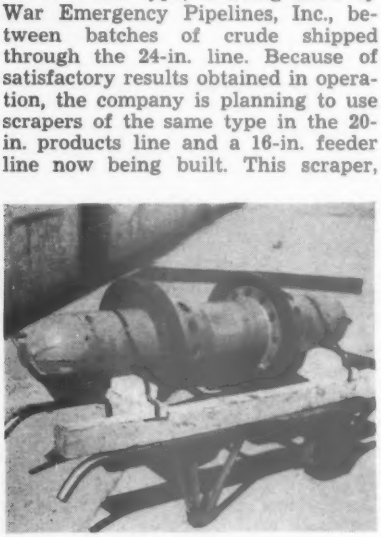
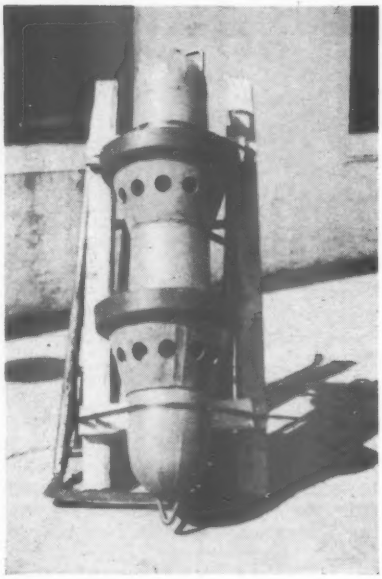
Floating Scraper Used On WEP Lines

A SCRAPER, referred to as of the flotation type, is being used by War Emergency Pipelines, Inc., between batches of crude shipped through the 24-in. line. Because of satisfactory results obtained in operation, the company is planning to use scrapers of the same type in the 20-in. products line and a 16-in. feeder line now being built. This scraper,



End view of flotation scraper

designed by T. D. Williamson, is built around an air chamber which provides sufficient buoyancy to substantially reduce the effective weight of the scraper while it passes through a line. Experience indicates that scrapers of this type may be practicable for petroleum lines of as small diameter as 14-in.



Top view of flotation scraper

The larger the diameter of the pipe, the greater is the reduction in the effective weight. This is indicated by the following comparison between the weight of scrapers under atmospheric conditions and effective weight while passing through the pipe.

Diameter of pipe (in.)	Weight of scraper atmosphere (lb.)	Effective weight of scraper in the pipe (lb.)
24	320	7
20	203	21
16	136	22

The air chamber is made of pipe closed at each end with orange-peel welding. On this there are welded the frames holding the synthetic-rubber scraper cups.

Horizontal Drilling

(Continued from page 51)

the rod pullers are equipped with 15-hp. motors, geared to a speed of 50 r.p.m. for the V wheels that grip the drill rods. Only a part of this power is being used in the operation.

An interesting record of the two test wells now being drilled is provided in the core record. Cores taken are from 20 to 50 ft. long and are removed in 5-ft. lengths and stored on the surface (Fig. 3). The cores reveal more than 1,000 bedding planes cutting across the sand in which the two wells are being drilled. These bedding plans run at all angies with the well and sometimes are parallel with the hole, and often split the core along 4 or 5 ft. of its length. Some of these planes occur only as lines of cleavage, almost invisible. But as they approach horizontal, each plane of cleavage may become a shale parting, sometimes ½ in. thick. The sand on one side of a parting may be entirely brown and so well saturated that oil drips from it, while the opposite side may be light gray in color and absolutely devoid of oil.

The core record also reveals the hardness and porosity of the First Venango sand, which varies horizontally to a considerable degree, often changing from a pure quartizite to a soft sand within a few feet. The sand texture also has determined the drilling speed on the two test wells, varying from 1 in. in 2 minutes in quartzite streaks to 50 ft. in 3 hours in a normal, soft sand stretch.

A unique arrangement has been provided for shooting the wells when they are completed. A pipe, embedded in the wall of the shaft, protrudes through the center of the dome of the work chamber. This will be connected to the casing head, thus permitting a free flow of exhaust from the well to the surface. In shooting, a full length hole charge of 80 per cent gelatine, extending from a point 500 ft. beyond the work chamber to the end of the hole, and weighing 3½ lb. per ft., will be used.

Surface structures on the project include a 26-ft. steel headframe over the shaft (Fig. 4), a power house of steel and concrete, and a brick fan house. Surface equipment includes a 75-hp. hoist to handle the elevator cage, a high-pressure water pump, a 75-hp. air compressor, and receiver tanks.

The operation now in progress is designed to tap approximately 400 acres of land. If all of the 24 wells for which port holes are provided in the work chamber, are drilled about 60,000 linear feet of producing sand will be opened up, an exposure which would be equal to about 3,000 vertical wells in the 20-ft. substratum to be worked.

Estimating results to be expected from the entire pattern of the project on the basis of oil sand to be exposed by the horizontal drilling method, it is claimed that more oil can be recovered from fields now abandoned than has been produced by primary methods. Pumping costs are estimated at only 1 cent per barrel, as the oil flows by gravity into receiving tanks, thus eliminating individual pumps, rods, engines, etc.

Other advantages claimed in the drilling of horizontal wells are conservation of steel, since horizontal wells require neither derricks, casing nor tubing, shackle lines nor sucker rods, nor miles of lead lines or pressure lines to individual wells; conservation of power, since the wells require less than one-tenth of the power necessary for the same length of sand exposed by vertical operations; and conservation of skilled labor, since horizontal wells require less than one-fourth as many men for an equal sand exposure as vertical wells.

Cracking Technology—No. 6

Catalytic Cracking Processes In Use Today

Four catalytic cracking processes are described here, Houdry, Fluid, Thermofor and Cycloversion. The first two use hydrous aluminum silicate as well as synthetic catalysts; Houdry uses a fixed bed system; Fluid catalyst is carried along by the vapor stream; Thermofor (T.C.C.) uses a coarse granular catalyst, handled mechanically; Cycloversion uses a fixed bed under conditions where high regeneration temperatures and thus high speeds for regeneration may be employed safely.

*by C. R. Wagner**

ALTHOUGH many patents have been granted over the last 40 years for processes involving catalytic cracking, it was not until 1933 that a reasonably successful semicommercial unit was demonstrated by the Socony-Vacuum Oil Co., Inc., at their Paulsboro, N. J., plant. The installation was a 1,000-bbl. Houdry vapor-phase unit cracking gas oil in the presence of a stationary bed of fuller's earth. The temperature employed was in the range 775° to 825° F. and the gasoline production from fresh gas oil was 30 to 35 per cent for a single pass through the catalyst. The gasoline was claimed to be chiefly isoparaffins with a high-octane number and very good stability. The recycle from the unit was regarded as being poor charging stock for the catalytic unit, but satisfactory for thermal cracking units.

Catalytic Cracking Progress

Development work was continued on the process, with the Sun Oil Co. taking a leading part, and in 1938 a paper was presented at the annual meeting of the American Petroleum Institute[1] which gave results obtained by the improved process. The temperature of cracking employed in the improved process is about 850° F. or higher, with the temperature maintained by circulating hot molten salt through pipes disposed in the catalyst bed. The endothermic heat of cracking does not, therefore, cause a reduction in the effective cracking temperature and the cracking rate is maintained throughout the catalyst bed. The catalyst used is a hydrated aluminum silicate (certain other synthetic catalysts are now in use due to the war program) which is regenerated at short intervals by means of mixtures of flue gas and air. The burning of the carbon deposited on the catalyst generates large quantities of heat; some of this heat is recovered by means of the molten salt circulated through the catalyst bed and part of the remainder is picked up in waste-heat boilers. While one catalyst case is being regenerated another is operating; so the process is continuous, with automatic controls to regulate the switching of vapors from one case to another.

The crack per pass at these higher temperatures is over 40 per cent on the average, and closer to 50 per cent for the first few minutes on freshly regenerated catalyst. Activity falls off rapidly as carbon accumulates on the catalyst and the reaction becomes somewhat less selective, with greater gas production and less gasoline formation. Although the gasoline produced contains 40 to 50 per cent olefins, there seem to be very few diolefins present. Claims that the process produces a gasoline very rich in aromatics are justified in those cases where selected charging stocks are used with certain catalysts; with the natural catalyst and many stocks the total per cent aromatics in the 400° F. end-point distillate is little greater than for most modern thermal processes. (See Table 1.)

Other catalytic cracking processes have been developed by the Standard Oil Development Co.[2] and its associates, Socony-Vacuum Oil Co., Inc.,[3] and the Phillips Petroleum Co. The "Fluid catalyst process" developed by the Standard Oil Development Co. uses a very finely divided hydrous aluminum silicate (other synthetic catalysts are also being used now), such as "Filtrol." The superheated gas-oil vapors are passed through a large chamber in contact with the catalyst which is carried by the vapor stream in much the same way that

TABLE 1

Process—	Gyro	C.H.P.	Houdry	Cat. cracked	Cat. ref.	Therm. ref. debutanized
Charge to unit—	Topped crude		Gas oil		Naphtha	
A.P.I. gravity of gasoline	57.9	60.8	55.3	57.7	50.7	49.6
Initial boiling point	97	98	95	112	106	126
10 per cent recovery	131	116	136	148	172	192
20	158	125	172	170	218	234
30	190	151	207	194	241	270
40	223	183	243	217	256	295
50	250	211	270	237	269	312
60	280	237	297	270	280	321
70	308	266	322	295	296	339
80	336	291	352	321	313	353
90	370	319	382	352	344	372
End point	412	405	408	394	390	402
Per cent recovered	97.0	97.1	96.8	97.8	98.0	98.0
Per cent loss	1.3	2.4	1.9	1.6	1.0	1.0
Reid vapor pressure	9.6	..	..	..	..	2.9
Analysis—	Initial to 140° F.					
Olefins	70	53	..	60	25	..
Aromatics	0	0	..	0	0	..
Paraffins	30	47	..	40	60	..
Naphthenes	0	0	..	0	15	..
	140° to 235° F.					
		(I.B.P. 235)				(I.B.P. 235)
Olefins	63	47	42	59	22	63
Aromatics	8	2	4	3	15	2
Paraffins	23	15	54	30	35	30
Naphthenes	6	36	0	8	28	5
	235° F. to end point					
Olefins	43	25	11	27	8	29
Aromatics	25	26	37	34	50	19
Paraffins	17	27	19	26	22	22
Naphthenes	15	22	33	13	19	30

*Consultant in refining technology.

water is flowed from a well by an air lift. The size of this reaction chamber and the rate of flow of vapor are regulated so as to give the proper time of contact between the catalyst and vapor. The vapors then pass into a dust collector where most of the catalyst drops out and is sent to a regenerator for burning off carbon accumulation. The vapors leaving the dust collector are quenched to just below the dew point; this effectively precipitates the remaining catalyst in the form of a slurry. The catalyst can be recovered from this slurry and regenerated with the other spent catalyst. The mixture of vapors is then fractionated to recover gasoline, gas and recycle stock. The characteristics of the products and the yields are similar to those encountered in the fixed-bed process.

T.C.C., Cycloversion Processes

The "Thermofor catalytic cracking process" developed by Socony-Vacuum Oil Co., Inc., is also a continuous moving-bed process, but uses mechanical means to recycle the catalyst. For this reason a coarse granular catalyst must be used and loss due to formation of fines is a problem in this process. The catalyst is elevated to the top of the reaction chamber and to the top of the regeneration kiln by means of mechanical conveyors. The principles employed are otherwise much the same as those found in the Houdry and "Fluid catalyst" systems. Characteristics of the products are also quite similar.

As yet little has been published by Phillips Petroleum Co. about their "Cycloversion" process. It is a fixed-bed process employing a cheap catalyst and capable of handling cracked or straightrun naphthas or selected gas oils to produce highly aromatic products. The product on fractionation supplies a desirable aviation blending stock, which would lead one to infer that it contains a small amount of olefins. The other catalytic processes mentioned produce a higher ratio of aromatics to olefins than thermal processes, and Phillips' process appears to be a further step in the same direction. For obvious reasons no detailed data have been published for any of these processes.

The most striking thing about all catalytic-cracking processes is the complete absence of residual fuel oil, except such fuel oil as may be produced in the primary distillation of the crude petroleum. The end point and color of the recycle stock are both lower than those of the gas-oil vapors delivered to the cracking zone.

In the thermal cracking process heavy fuel-oil polymers are always formed, even from the cleanest and most paraffinic charging stock. In the catalytic cracking of petroleum, heavy fuel-oil polymers are never found in the recycle, but coke deposition on the catalyst is favored by the same conditions that increase fuel-oil production in thermal cracking. It may be, therefore, that the catalyst causes polymerization to occur so rapidly and to proceed so far that the polymers condense out on the catalyst and then decompose to form gas and coke. At much lower temperatures and in the liquid phase we know that fuller's earth will polymerize colored bodies in heavy lubricating oil and at the same time do a certain amount of cracking of the oil itself. It is doubtful if anyone can state with certainty at this time just how these catalysts function. It is customary to assign as a reason for their activity the very extended surface possessed by such materials, which is equivalent to saying, "These are good catalysts because they are very active."

The recycle stock from catalytic cracking is quite aromatic in character. Murphree, in the article referred to above, gives tests on several such stocks, indicating that the aniline point for the recycle is lower than the fresh feed by 35 to 85 points, while the gravity remains about the same and the 50 per cent point drops 100° to 200° F. It seems probable that one of the principal reactions occurring in the catalytic process is the splitting off of long alkyl-side chains, leaving the aromatic or poly-aromatic nuclei in the recycle stock. These nuclei probably have a number of short alkyl-side chains and will not make gasoline except by a decomposition profound enough to split the nuclei themselves. For this purpose the relatively low temperatures employed in catalytic cracking are not so effective as the conditions found in thermal cracking. Such an explanation would also account for the larger amount of coke and gas produced when such recycle stock is put through the catalytic units.

In Table 1 are given analyses of several types of cracked gasoline. Although such analyses are not too exact, the figures are interesting and instructive.

Catalytic reforming is but one type of catalytic cracking, although the technique employed is modified according to the results desired. At present the most common process used for catalytic reforming of naphtha is that known as hydroforming.[4] At least one other[5] is available and press releases indicate that others may be ready for installation. Both of these processes use a fixed-bed catalyst and both recycle fixed gases through the cracking zone. Because of the present emergency details of the catalyst composition and exact operating conditions are not available for publication. The catalyst is presumably some metallic oxide supported on such a material as aluminum oxide.

Hydroforming Process

In the case of the hydroforming process the cracking temperature is in the neighborhood of 1,000° F. and the operating pressure in the range of 10 to 20 atm. Recirculation of gases rich in hydrogen through the catalyst cases keeps the catalyst active for a longer period than would be the case with no such recirculation. Another desirable result of the high hydrogen partial pressure is the reduction in olefin concentration in the finished product. A simplified flow sheet of the hydroforming process is given in Fig. 1.

At regular intervals the catalyst is regenerated by flushing vapors out with flue gas and then forcing a mixture of flue gas and air through the catalyst case under pressure. Coke is thereby burned off the catalyst particles and catalyst activity is restored. The temperature of regeneration must be carefully watched to avoid overheating of the catalyst which would reduce its efficiency. Regeneration is usually carried on at

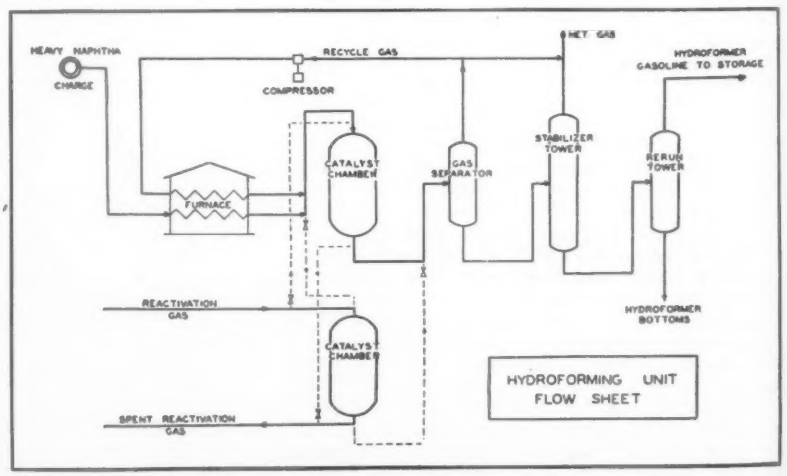


Fig. 1: Simplified flow sheet of the hydroforming process. (See article by Smith and Moore in The Oil and Gas Journal, March 27, 1941)

about 1,000°-1,150° F. Heat generated by the combustion of the deposits on the catalyst granules may be recovered by means of waste heat boilers. Some disintegration of the catalyst granules occurs during regeneration and possibly during the actual hydroforming operation. For this reason proper precautions must be taken in handling gases leaving the cases to prevent erosion of compressor cylinders by the catalyst dust.

Aromatics by Catalytic Reforming

A high percentage of aromatic hydrocarbons is found in the product from this operation. The reaction seems to proceed, first by dehydrogenation of the paraffins, then by cyclization to the cyclohexane derivatives, and finally by dehydrogenation of the naphthenes. By charging to the apparatus a narrow-boiling cut consisting essentially of n-heptane and methylcyclohexane a product containing a high percentage of toluene may be secured. By charging the usual 250° to 400° F. boiling range naphtha a mixture containing aromatics from benzene to the complex alkyl benzenes may be produced. In this case, however, the lower-boiling benzenes are present in smaller quantities.

Much higher yields and octane numbers are obtained by using the catalytic reforming process than by thermally reforming the same stock. The explanation is of course that the catalyst makes possible the splitting off of hydrogen with a minimum amount of demethanation. Gases from thermal reforming usually contain more than 50 mol per cent methane, whereas in catalytic reforming the gases are at least 60 mol per cent hydrogen except when making a very high-octane-number product.

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BOOK REVIEW

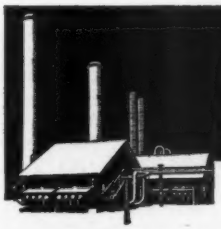
PONTOTOC COUNTY MINERAL RESOURCES; CHOCTAW COUNTY MINERAL RESOURCES. These are two bulletins of the Mississippi State Geological Survey. Richard Randall Priddy and Franklin Earl Vestal supplied the geology and tests were by Thomas Edwin McCutcheon. Neither of the counties is in the oil-producing region of the state.

"The life and soul of science is its practical application."
—Lord Kelvin

1811-1899
Robert Wilhelm von Bunsen was a notable chemist whose one exploration in physics resulted in determining the vast amount of furnace heat lost with waste gases.

His invention of the Bunsen Burner, the principle of which is incorporated in every burner employed in various arts and manufactures, was a notable contribution to science.

Discoveries of the scientists of the past result in the applied engineering of the present. Alcorn, for 19 years, has used scientific discoveries, engineering skill and knowledge of processing requirements for the solution of the many specialized demands for the application of heat to petroleum products refining. For every type of installation, low temperature or high, Alcorn's pioneering has resulted in the design and construction of heaters for efficient, economical, controlled operation.



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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Analyzing for Butenes

Butylenes

Will you please give us good methods of analyzing for butylenes in cracked gas?—L.F.

The selection of analytical methods is in most instances beyond the province of this page, but it is possible to direct our readers to suitable references. The following list of references shows some of the more recent studies of the methods of determining butylenes. An attempt has been made to separate the references with regard to the analytical method employed, but it should be borne in mind that many of the methods overlap one another.

Recourse should also be had to the Butadiene Subcommittee of Technical Advisory Committee to the Synthetic Rubber Committee of Petroleum Industry War Council.

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Anhydrous Hydrochloric Acid

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This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Questions should be submitted in as much detail as possible. Inquiries must be signed, but only the given initials will be printed. The source of the question is considered to be confidential. Questions requiring a discussion of patents, extended computations, or a detailed study cannot be considered. When the matter is of general interest, a reply will be published within a reasonable time.

West Texas Crude

(Continued from page 47)

roded. It was recommended that all tubes and headers be replaced with 4-6 chrome material as soon as possible; that immediate steps be taken to line the upper portion of the flash chamber and replace the residuum drawoff line with 4-6 chrome material; and that all nozzles operating above 650° F. be protected with 11-13 chrome linings. The residuum extension line was seriously corroded, and 11-13 chrome lining was recommended. The 8-in. vapor line between the tower and fractionating column was also badly damaged, and a 4-6 chrome replacement was advised. In addition, the lower portion of the fractionating column was seriously affected, so that a ganister lining to protect the bottom 16 ft. was recommended.

The fourth inspection was made 123 days after the third inspection, and still further evidences of corrosion were found.

The condition of the equipment after the fifth inspection, which was made about 90 days after the fourth one, is briefly summarized as follows:

Condenser section. — The tubing was found to be in good condition. However, the cast iron heads and tube sheets were badly corroded and needed immediate replacement.

Fractionating tower. — This vessel was drilled 12 in. above the ganister lining and showed a metal loss of 0.15 in. Just above the bottom tray the shell thickness was found to be 0.611 in., which was approximately the original thickness. Therefore, it was recommended that additional lining be installed for a distance of 24 ft. above the lining. Some loss also was noted in the bubble caps of the bottom tray.

Hot-oil pump suction and discharge lines.—These 10-in. and 8-in. pipes of extra heavy series were put in service with the original installation. The original wall thickness was 0.593 in. while the corroded wall thickness was 0.200 in.—a loss of 66 per cent. This line required prompt replacement with 4-6 chrome material.

The discharge line of the hot-oil pump had a metal loss of ¼ in. from the original, and it was recommended that it be replaced with 4-6 chrome.

Hot-oil pump.—The inner volute case was found badly corroded during the previous shutdown and was replaced with one of 11-13 chrome material.

Heater tubes and fittings.—Corrosion of the heater tubes was more rapid than in other plants. Although about three-fourths of a pound of lime per barrel of charging stock was used to retard corrosion at this plant, the rate was still unusually severe. The mild steel convection tubes had an average loss of 1/64 in. for every 11,700 bbl. charged to the crude stills. The shock tubes showed 1/64 in. loss for every 7,500 bbl., while one of the hip tubes indicated as high a rate of loss as 1/64 in. for every 5,800 bbl. In other words, this particular ½-in. wall tube would have corroded through in about 80 days.

Chrome steel tanks.—About eighteen 4-6 chrome tubes were installed shortly after the third inspection. These tubes showed an average loss of 1/64 in. for every 170 days of operation with a total throughput of 265,000 bbl. of crude. Thus, the expected life of 4-6 chrome tubes is 4 years as compared with 80 days for the mild steel tubes. This fact indicates that the plant can be operated more economically as well as safely, through the use of the 4-6 chrome material. At least 35 more chrome tubes should have been replaced with 4-6 chrome material.

As for fittings, a total of 41 mild steel return fittings were at or close to the retiring thickness and needed early replacement.

Transfer line.—Total metal loss in this line since the unit had started was 0.074 in.; therefore, no replacement was necessary for the next 18 months.

Reaction chamber. — The reaction chamber showed no indication of severe corrosion in the cylinder of the vessel. However, the top manway neck required protection with a chrome liner, as there was a total loss of metal of 0.140 in. The 4-in. bottom drawoff nozzle was replaced shortly before the fourth inspection, after it had corroded through. This was a double extra heavy nozzle with a wall thickness of 0.674 in. Replacement in the near future with 4-6 chrome material was recommended.

Drawoff line from reaction chamber to flash chamber.—This line also showed severe corrosion and, as recommended previously, needed to be changed to 4-6 chrome as soon as possible.

Flash chamber.—This vessel was previously protected with ganister lining on the top head and for 10 ft. down the shell. At this time, however, it was found that it would be necessary to line the entire side wall, preferably with 11-13 chrome. The 10-in. vapor outlet nozzle needed also to be replaced and lined with 11-13 chrome.

Flash chamber vapor line.—At the time of the inspection this particular line had sufficient metal, as the original thickness had been unusually heavy (0.906 in.) However, it had been reduced to 0.780 in., which was a loss during this short period of 0.126 in. Therefore, it was recommended that provisions be made to have a 4-6 line in stock when it became necessary to change this line.

Residuum drawoff line to pump.—This carbon steel line also had a short life, and during the inspection it was found to be close to the retiring thickness of 0.170 in. On account of the small liquid head, it was recommended that the size be changed from 4 to 6 in. when the new 4-6 chrome line was ordered, so that better pump suction might be obtained.

Residuum pump discharge to exchangers.—This particular line was also close to the retiring thickness of 0.150 in. However, its average life was 18 months; therefore, the new line could be fabricated from some of the old ½-in. wall tubes available at the plant.

Eight-inch vapor line from fractionator to condensers.—This line was found to be in good condition, and it probably would not require changing for several years.

Straight-Run and Reformed Gasolines

The sulfur content of the straight-run gasoline, like that of the crude oils, varies considerably with the fields. In many cases the total sulfur content may be 0.2 or 0.3 per cent, or even higher. Table 5 shows the distribution of sulfur in its various chemical forms in a naphtha obtained from a Yates crude.

In the reforming of a straight-run gasoline, some of the sulfur compounds are decomposed to hydrogen sulfide, as well as higher boiling

TABLE 5

Sulfur—	Per cent
Hydrogen sulfide	0.003
Elemental sulfur	0.012
Mercaptans	0.044
Disulfides	0.032
Sulfides	0.082
Residual	0.049
Total	0.222

TABLE 6

Properties of West Texas Straightrun Gasoline

Gravity, °A.P.I.	59.3
Specific gravity at 60° F.	0.7416
Sulfur, per cent	0.19
Vapor pressure, Reid, lb.	7.4
Octane No., motor method:	
Without lead	51.0
Without lead*	50.5
With TEL 1 cc./gal.*	57.0
With TEL 2 cc./gal.*	61.5
With TEL 3 cc./gal.*	65.0
Characterization factor	12.03
100 ml. distillation:	
I.B.P., °F.	107.0
5 per cent	145.0
10	166.0
20	194.0
30	215.0
40	234.0
50	253.0
60	273.0
70	295.0
80	326.0
90	360.0
End point, °F.	414.0
Per cent over	98.0
Per cent bottoms	1.2
Per cent loss	0.8

*After caustic washing and doctor sweetening.

cyclic compounds, with the result that the thermally reformed gasoline contains a smaller percentage of sulfur than the original charging stock contained.

Table 6 shows the properties of West Texas straight-run gasoline, used as charging stock for reforming, and Table 7 gives data on the thermally reformed product.

Catalytic Cracking of West Texas Stocks

The silica-alumina catalyst employed in catalytic cracking is also a good desulfurizing catalyst. A considerable amount of sulfur appears as H_2S in the process gas, while there seems to be little or no concentration of the sulfur in the recycle stock. Table 8 gives the properties of a gas-oil charge to a fluid catalytic cracking unit. Although this particular gas oil was not obtained from a West Texas field, the data from the cracking of this stock are cited because they typify what may be expected when West Texas stocks are cracked.

This stock was cracked at a relatively high temperature, and the products formed, expressed as weight per cent of charge, were:

Gas	22.5
Gasoline (400 E.P)	36.1
Recycle stock	37.6
Carbon	3.8

*After caustic washing and doctor sweetening.

TABLE 7
Reforming Results—Dubbs Pilot Plant

Yields, vol. per cent of charge:	
Gasoline	78.6
Fractionator bottoms	1.6
Liquid recovery	80.2
Liquid volume loss	19.8
Gas, cu. ft. per bbl. of charge	520
Properties of products—	
Untreated gasoline:	
Gravity, °A.P.I.	60.0
Vapor pressure, Reid, lb./sq.in.	10.0
Sulfur, per cent	0.08
Octane No., motor method	74
100 ml. distillation:	
I.B.P., °F.	99
5 per cent	123
10	134
20	154
30	175
40	194
50	214
60	234
70	256
80	287
90	335
95	374
End point, °F.	402
Per cent over	97.5
Per cent bottoms	1.0
Per cent loss	1.5
Composition of untreated gasoline:	
Liquid volume, per cent:	
Propane	0.00
Isobutylene	0.79
N-Butylene	2.08
Butanes	4.56
Pentanes to 115° F. (46° C.)	13.73
Fraction boiling above 115° F.	78.84
Total	100.00
Fraction boiling above 115° F.:	
Gravity, °A.P.I.	52.1
Specific gravity at 60° F.	0.7707
Fractionator bottoms	
Gravity, °A.P.I.	21.1

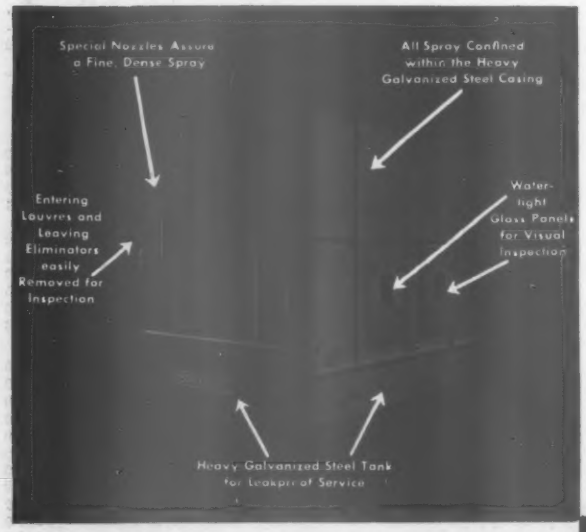
The distribution of sulfur in the charge and the products is shown in Table 9.

Gas-oil charging stocks with a sulfur content of 0.67 per cent can produce gasoline in one pass with a sulfur content as low as 0.03 per cent. With high sulfur charging stocks it is not always practical to produce a

TABLE 8
Properties of Gas Oil to Catalytic Cracking Unit

Gravity, °A.P.I. at 60° F.	33.9
Specific gravity at 60° F.	0.8555
Sulfur, per cent	0.53
B.s. and w., per cent	trace
Viscosity:	
Universal at 100° F., sec.	36.1
Kinematic at 100° F., cts.	3.037
Cold test, °F.	—15.0
Pour point, °F.	—10.0
Cloud point, °F.	5.0
Flash point, Pensky-Martens, °F.	175.0
Color	4.5
Aniline point, °F.	142.2
Conradson carbon on 10 per cent bottoms, per cent	0.17
Characterization factor	11.55
Molecular weight	200.0
100 ml. distillation:	
I.B.P., °F.	390.0
5 per cent	423.0
10	439.0
20	455.0
30	471.0
50	505.0
70	545.0
90	605.0
95	640.0
End point, °F.	667.0
Per cent over	99.0
Per cent bottoms and coke	1.0

"WETTING DOWN" of Buildings Eliminated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Here are the definite advantages which these air washer type cooling towers offer you:

1. **They are usually installed with air circulating fan located at the leaving end of the equipment—permitting the warm moist air to be discharged into the atmosphere at any convenient place *without wetting down of surrounding buildings.***
2. **They can be furnished so proportioned that they will bring down the temperature of incoming water to that of the outside wet bulb.**
3. **In many instances they effect a saving in initial equipment cost.**

Sturtevant Air Washer Type Cooling Towers are available in one, two and three stage, also two stage, two spray bank per stage types to meet local conditions. They are of typical Sturtevant sturdy, long-lasting construction —built of heavy gauge galvanized steel. Tanks made either of this steel or heavy plate welded black steel painted with bitumastic.

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Sturtevant
Puts Air to Work

gasoline in one pass unless the sulfur content is sufficiently low to permit its incorporation in aviation motor fuels. The sulfur in the gasoline can be reduced to 0.05 per cent or less by a retreating operation conducted at a temperature varying from 750 to 950° F. The silica-alumina cracking catalyst is also used in this operation. The retreating step not only decreases the sulfur content of the first-pass gasoline, but also improves its motor-fuel qualities.

The first-pass gasoline can be given an acid retreat, which both reduces the sulfur content and improves the motor fuel characteristics, particularly the lead susceptibility. The quantity of sulfuric acid used in the treating process varies from 5 to 20 lb. per bbl. of 93 per cent acid. A 15-lb. treatment may, for example, reduce the sulfur content of a 7-lb. gasoline from 0.20 to 0.035 per cent. The total loss in volume in the gasoline boiling range with such a treatment is around 15 per cent because of the formation of sludge and recoverable polymer.

TABLE 9

Stream:	S in stream	Lb. S/hr.	Wt. % total S
Charge	*0.53	0.0943	100.0
Total process gas	†522	0.0469	49.8
Gasoline as produced	*0.13	0.0084	8.9
Recycle stock	*0.41	0.0275	29.1
Recovered in products	....	0.0828	87.8
Unaccounted‡	....	0.0115	12.2

*Weight per cent of sulfur.
†Grains of H_2S/100 cu. ft.
‡This remaining sulfur probably leaves the plant in the regenerator outlet gases as SO_2 or in the process water drawn off the fractionator receiver. No sulfur determinations were made on these streams throughout this test.

The fluid catalytic cracking equipment as now designed can, for the most part, be utilized in processing gas oil of relatively high sulfur content. The regenerators and lines leading from the regenerator to the waste heat boilers are refractory-lined. The reactors themselves, when processing high sulfur stocks, have alloy liners which may be 11-13 chrome. The cyclones within the reactors and regenerators are made sulfur-resistant by the use of alloy material. The transfer lines for the catalyst are usually fabricated of low-carbon steel but are refractory-lined. The transfer lines from the reactor to the fractionating column for high sulfur stocks are made of low-carbon steel and are lined with alloy. The fractionating column is lined with alloy up to the first center well when high sulfur stocks are cracked.

The Individual Refiner's Problem

Data from commercial units show that ferrous alloys of low chromium content, such as a 4-6 chrome, have satisfactory resistance to corrosion, but these allow metals have a very high priority at this time. If even a limited amount of alloy metals for protection against corrosion were made available, the problem of the refiner would be greatly alleviated. Ganister linings have a much shorter life than do the chromium alloys and are readily available for lining the larger vessels, such as the bottom of the fractionating column, the flash chamber, and perhaps the upper part of the reaction chamber. Although not so durable as linings constructed of alloy metals, they nevertheless do afford protection against corrosion and satisfy the problem for the larger vessels. The use of lime in quantities permitted by fuel-oil specifications is recommended. In this connection there are occasions in which it is feasible to blend a fuel oil having a high lime content with one free from lime in order to meet specifications. Ammonia is recommended for the condenser coil. If it is added in the fractionating column, trouble is often encountered because of plugging of the bubble caps resulting from the formation of solids. In some cases West Texas charging stocks may be mixed with other more desirable charging stocks that are available in sufficient quantities, in order to produce a feed having moderate corrosive properties.

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for salt water and lead lines

Here are other ways you gain with this asbestos-cement pipe!

HIGH RESISTANCE TO CORROSION results in longer life and lower maintenance.

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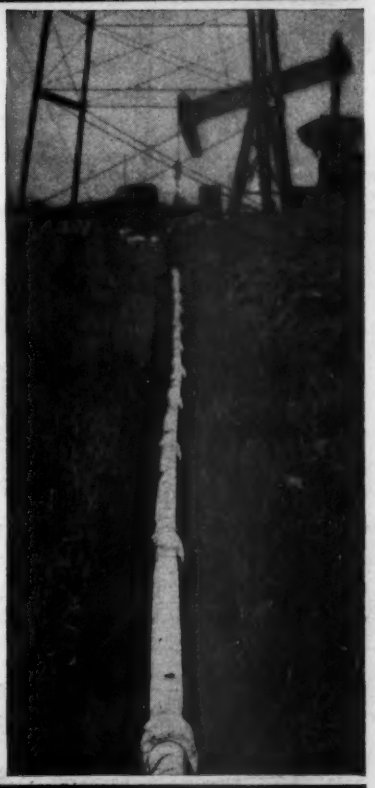

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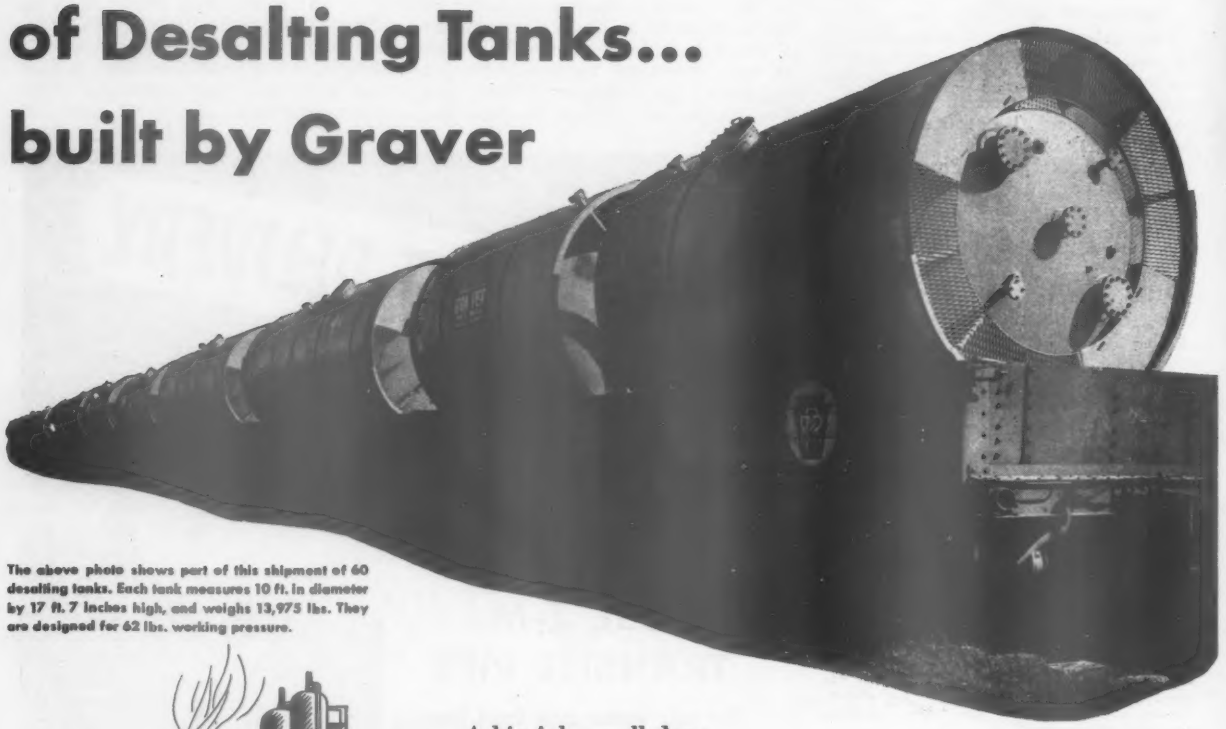
of Desalting Tanks... built by Graver



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Engineering Fundamentals

No. 109

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

PREDICTION OF PRODUCTIVITY FROM CORE ANALYSIS

IT is usually desirable to predict, in advance of an actual production test, whether or not a well will produce oil. In case the well is expected to be capable of producing oil, it is also desirable to predict the approximate rate at which the exposed section in the well should be capable of yielding oil when the well is placed on production. The results of core analyses, supplemented by other information (such as electrical logs, reservoir pressure measurements, and characteristics of the reservoir fluids) can be used for this purpose.

A porous and permeable section which shows no oil saturation would obviously be either gas-productive or water-productive. Core samples having complete or almost complete, water saturation indicate that the sand is water productive. Water saturations not appreciably in excess of the normal interstitial water content, in the absence of oil saturation, indicate a gas sand. Data of the type illustrated in Fig. 1 of Installment 108 will aid in estimating, from permeability values, the normal interstitial water content. At least, presence of gas in a sand prevents the entry of contaminating water from the drilling mud to sufficient degree that a water sand can usually be distinguished from a gas sand if careful methods of interpretation are used in evaluating the results of tests of core samples.

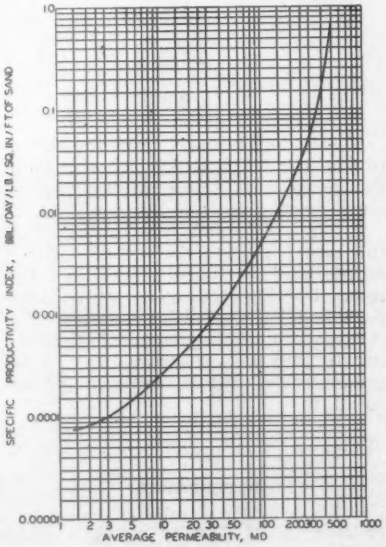


Fig. 1

Formation Fluid

The mere presence of oil in a core sample does not mean that the interval from which the core was taken will yield oil when exposed to production. When under formation conditions,* a sand must show a sufficiently high oil-water ratio that a small pressure gradient in the sand will cause oil, rather than water or gas to flow from the sand. Since water and oil saturations as determined at the surface do not represent the water and oil content of the undisturbed formation, but must be corrected for contaminating influences involved in the coring process, there is always a possibility of considerable error in the reconstructed formation fluid content. Whether a sand containing both oil and water will produce water-free oil depends upon the effective permeability of the sand to oil as compared to its effective permeability to water under the existing reservoir saturation conditions.† A means of accurately and easily measuring effective permeabilities of consolidated sands has not yet been devised. Thus, it is necessary, at present, to use empirical rules for deciding whether a sand will produce oil or whether it will produce water.

There is no exact oil-water ratio below which it may be said that all sands will produce water and above which all sands will produce oil. However, a consideration of oil-water ratio along with other conditions existing in a sand may make possible an evaluation of the critical oil-water ratio for a given sand. Other influencing conditions that should be considered in determining the critical oil-water ratio are: normal permeability, oil gravity, formation pressure, gas-oil ratio, closeness of cored interval to an overlying shale, amount that mud pressure exceeds formation pressure while coring, and rate of penetration while coring.

For example[1], in one field the critical oil-water ratio is of the order of 0.05 when the following conditions prevail: total saturation (oil and water) below 90 per cent of the pore space, permeability above 100 millidarcys, oil gravity above 30° A.P.I. formation pressure above 2,000 lb. per sq. in., gas-oil ratio above 1,000 cu. ft. per bbl., sand considerably below the nearest shale-break, and mud pressure considerably in excess of formation pressure. On the other hand, a sand may be productive of water rather than oil even though the oil-water ratio is as high as 0.35, when most of the conditions mentioned are opposite to those given above.

The above example points out the factors that have been found to influence the value of the critical oil-water ratio and gives a basis from which to start in estimating the critical oil-water ratio in any field. If records are kept concerning the various factors mentioned, along with the results of drill-stem tests and full-scale production tests on a uniform sand section, empirical values of oil-water ratio for various sand conditions can be approximated from a study of such records.

In connection with the prediction of productivity from core analysis and other data it is helpful to construct a graphical representation of all of the data available on the formation interval exposed at the particular well. Porosity permeability, oil saturation, water saturation and oil-

*That is, based on the natural formation fluid content as reconstructed from the laboratory test results of core samples, taking into account the effect of flushing and pressure reduction attendant to the recovery of the core.

†**Effective permeability** was defined in Installment 105 of this series.

Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

Engineering Fundamentals

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

water ratio may be shown graphically along with a depth scale, electric log, and graphic log. Diagrams of this type are presented by Pyle and Sherborne.[2] Plotting of the salinity of the water contained in the sand may be desirable in many cases, particularly in connection with the interpretation of electrical logs. This sort of diagram furnishes a convenient means of distinguishing at a glance between oil-productive, water-productive, and gas-productive sands after one has established delimiting saturation values for the particular set of other conditions existing.

Predicting Rate of Production

After it has been determined that a sand will be productive of oil, it is possible to estimate the probable rate at which the oil may be produced. For this purpose an empirically established relation between specific productivity index and average permeability is useful. Such a curve is illustrated in Fig. 1.[3] The data for a curve of this type is obtained from the results of bottom-hole pressure surveys in which the productivity index is determined* and from the results of core analyses on the same wells. The permeability values plotted are **normal** permeability as determined by air flow through clean dry sand, and thus the need for evaluating the effective permeability is eliminated.

A curve of this type plotted on the basis of water-free oil should apply broadly to a large number of fields. Characteristics of the oil, such as gravity and viscosity, will cause some change in the relationship, which make it advisable to construct different curves for various broad ranges of oil gravity. The curve of Fig. 2 is based on data taken from wells where the oil gravity ranged from 29 to 39° A.P.I. It has been found also that some wells vary from the relationship, apparently due to differences in the saturation pressure of the oil.[1] When the saturation pressure of the oil is sufficiently high that gas bubbles form in the sand on the productivity index tests, such bubbles cause additional resistance to flow of oil through the sand, and thus reduce the productivity index for a given sand permeability and set of oil characteristics. Entry of drilling mud into the formation adjacent to the well bore would have a similar effect, meaning that a well in which such a condition exists to a high degree would fall below expectations as to productivity index.

*Installment 87.

Specific Productivity Index

Using Darcy's law, a theoretical specific productivity index can be calculated for a given set of pressure conditions, sand permeability, sand thickness, well radius, drainage radius, and oil viscosity. This theoretical value of specific productivity index will always be higher than the actual specific productivity index because the former index is based upon the normal permeability of the sand (as determined with a clean and dry core using air as the test fluid) rather than upon the effective permeability of the sand to oil. In other words, the presence of interstitial water, and possible presence of gas bubbles and drilling mud in the sand cause additional resistance, over and above that indicated by the normal permeability, which reduces the productivity index below the theoretical value. This disparity between the actual and theoretical value is more severe in sands of low permeability. This is to be expected because of the fact that the sands of lower permeability contain a higher percentage of interstitial water.*

Nevertheless, the theoretical specific productivity index is valuable because it represents the ideal maximum to which the actual index can be compared and indications obtained concerning the quality of well completion. Wider than usual divergence between actual and theoretical productivity indices often indicates a poorer quality of completion or some other condition that might possibly be alleviated by remedial work on the well.

The theoretical specific productivity index, based on Darcy's law, may be calculated using the following formula:

$$SPI = \frac{3.073\ K}{u \log \left(\frac{r_e}{r_w}\right)}$$

where,

SPI = specific productivity index, bbl. per 24 hr. per lb. per sq. in. drop in pressure per foot of sand thickness.
K = normal permeability, darcys.
u = viscosity of oil, cp.
r_e = assumed drainage radius, ft.
r_w = radius of well bore, ft.

*Refer to Fig. 1 of Installment 108.

EXAMPLE

Problem: Given the following data concerning a well:

Static bottom-hole pressure, lb. per eq. in., ga. = 1255.

Productive sand thickness, ft. = 45.

Average permeability, md. = 300.

Viscosity of oil at reservoir conditions, cp. = 3.8.

1. On the basis of the ratio r_e/r_w = 2000, calculate the theoretical specific productivity index for this well. Compare with value obtained from the curve of Fig. 1.

2. Assuming that the curve of Fig. 1 will apply to this well, calculate the expected productivity of the well when the flowing bottom-hole pressure is 600 lb. per sq. in., ga.

Solution:

1. To calculate the theoretical specific productivity index,

$$SPI = \frac{3.073\ (0.3)}{27 \log 2000}$$

$$= \frac{3.073\ (0.3)}{3.8\ (3.301)}$$

$$= 0.0734$$

The value obtained from the curve of Fig. 1 is 0.055, which is lower than the theoretical value in accordance with what one would expect.

2. The expected productivity of the well can now be calculated by multiplying the specific productivity index by the productive sand thickness and by the difference between static bottom-hole pressure and flowing bottom-hole pressure. Then, the productivity of this well should be equal to

(0.055) (45) (1255—600) = bbl. per day.

REFERENCES

1. Johnston, Norris, "Core Analysis Interpretation" A.P.I. Drilling and Production Practice, 1941, pp. 180-199.

2. Pyle, H. C., and Sherborne, J. E., "Core Analysis" A.I.M.E. Petroleum Development and Technology, 1939, pp. 33-61.

REFINING

District 2 Refining Control Moved to Chicago

WASHINGTON, D. C. — Responsibility for establishing processing rates and for issuance of operating directives in District 2 (Middle West) was assigned last week to W. W. Vandeveer, PAW District 2 director in charge, or Charles H. Alberding, District 2 director of refining, both officing at Chicago.

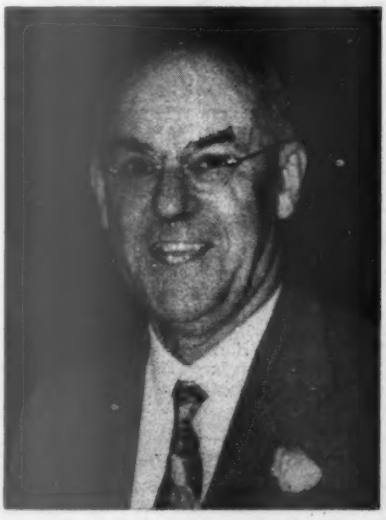
General rules were issued by the central PAW office here which will be followed by the District 2 executives in dealing with the manufacturing phase of operations. Instructions included:

"The permitted crude runs to be set for war-products plants should be the minimum amount of crude actually required to produce maximum production of war products which now include 87-octane gasoline but does not include asphalt, except that

Sketches of Plant Operators

CHARLES W. SHAEFFER, superintendent of the East Providence R. I., refinery of Socony-Vacuum Oil Co., Inc., recently observed an anniversary that few people experience. It was the fiftieth anniversary of his career in the oil industry, all of which has been spent with one company.

Mr. Shaeffer became part of the Socony organization on June 23, 1893, when he obtained employment as an office boy at the 25 Broadway office of Standard Oil Co. of New York. He was about 14 at the time and his first work was with the department in charge of packaging much of the kerosene which the company then shipped throughout the world. Four years later he went to the Devoe plant at Long Island City as a bookkeeper. The Devoe plant was devoted to the manufacture of 5-gal. cans and their packaging.



Upon the death of the can-factory superintendent, Mr. Shaeffer was elevated to that position. In 1913 he toured the Far East inspecting the company's case and can plants in India, Japan, China and Australia. He returned late that year to direct the rebuilding of the Long Island City plant which had been destroyed by fire and at the same time was appointed general superintendent. This was one of the first plants to employ a conveyor assembly line.

Four years later, the plant was enlarged by the inclusion of the case and can department of the Pratt works. In the following year, 1918, Mr. Shaeffer was made superintendent of the entire Long Island refinery. The Devoe plant then had a capacity of 100,000 5-gal. cans per day and 50,000 2/5-gal. cases. With the perfection of the bulk-oil tanker about that time, the Devoe works gradually diminished in importance.

Mr. Shaeffer became superintendent of the East Providence refinery in June 1920. He was responsible for the construction of the company's first eastern products pipe line in 1931, the Providence-Springfield line, as well as the Buffalo-Rochester-Syracuse line built in 1940 and the Paulsboro-Gibson Point line in 1941.

The Providence refinery employes presented Mr. Shaeffer with a mahogany desk and chair and a desk light at a dinner observing his fiftieth anniversary with the company. Other guests attending the affair added a desk set.

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no plant shall be required to run less than 80 per cent of its established normal. Plants formerly on the list of war-products plants solely because of asphalt manufacture are now to be classified as nonwar plants. Their maximum permissible crude runs should be set at 80 per cent of their established normal which figure continues in effect for the other nonwar plants."

A standard form will be used in instructing war plants of their operating schedules as follows:

"You are directed to produce the maximum quantity of the following materials: 100 and 91-octane number aviation gasoline and components thereof, toluene, butadiene, petroleum synthetics and 87-octane all-purpose gasoline Army Specification 2-103A as revised, and aviation and heavy-duty lubricating oils should be maintained."

Taylor Contract for War Plant Raised $390,000

WASHINGTON, D. C.—The overall commitment of Defense Plant Corp. for aviation-gasoline facilities at one of Taylor Refining Co.'s plants in Texas was increased last week to $1,400,000. DPC increased its original commitment by $390,000 for installation of additional equipment and capacity not covered by the original contract for $1,010,000.

British-American Plant Nearing Completion

TORONTO, Ont.—Construction of the British-American Oil Co. refinery at Clarkson, near Toronto, will be completed in the near future, according to W. K. Whiteford, president of the company. The plant is designed to produce aviation gasoline and other vital war materials. The company has also installed additional equipment in its existing refineries.

Grease Developed for Temperature Extremes

NEW YORK.—Finding a grease that would keep airplane controls working in both killing cold and burning heat is a job that has been licked by Standard Oil Co. (New Jersey) scientists, according to an article in the forthcoming issue of the company magazine, the Lamp.

Among the many problems presented by high-altitude flying, according to the Lamp, is that of grease which will lubricate through a wide range of temperature. A plane standing in the sun at a North African base may heat up to 150 degrees, it is pointed out, at which temperature an ordinary lubricant might well become too thin to function properly, with resultant danger to the airplane.

The same plane, taking off and climbing many thousands of feet, could be in temperatures as low as 60 below. An ordinary lubricant, which was heavy enough to stand up under the ground temperature, would thereupon become so thick that such mechanisms as the pulleys on which control cables run would not move and the cables might fray out.

This problem was posed to scientists of the Jersey Standard company in the spring of 1941, the article says, and the answer—a grease known as M-285 and made with a special soap base—was produced by the fall of the same year, shortly before Pearl Harbor. As production got under way, output jumped from 100 lb. in 1 month to 22,000 lb. the next. A few months later it was 30,000 lb. and has since more than doubled.

New Cracking Catalyst Announced by Filtrol

LOS ANGELES, Calif.—A cracking catalyst made from chalky clay of the Arizona desert is being introduced by the Filtrol Corp., Wright W. Gary, president of that company, announced here last week. The catalyst was originally a "volcanic ash" and is prepared in pellet form, Mr. Gary stated, at plants in California and Mississippi.

According to the announcement, a fixed-bed process is used, and existing thermal cracking or refining units can be converted to catalytic cracking at a low expenditure for additional equipment, it is stated.

The catalyst and process is being used in a Texas refinery, Mr. Gary stated, the first of 28 such units which will start operation within the next few weeks.

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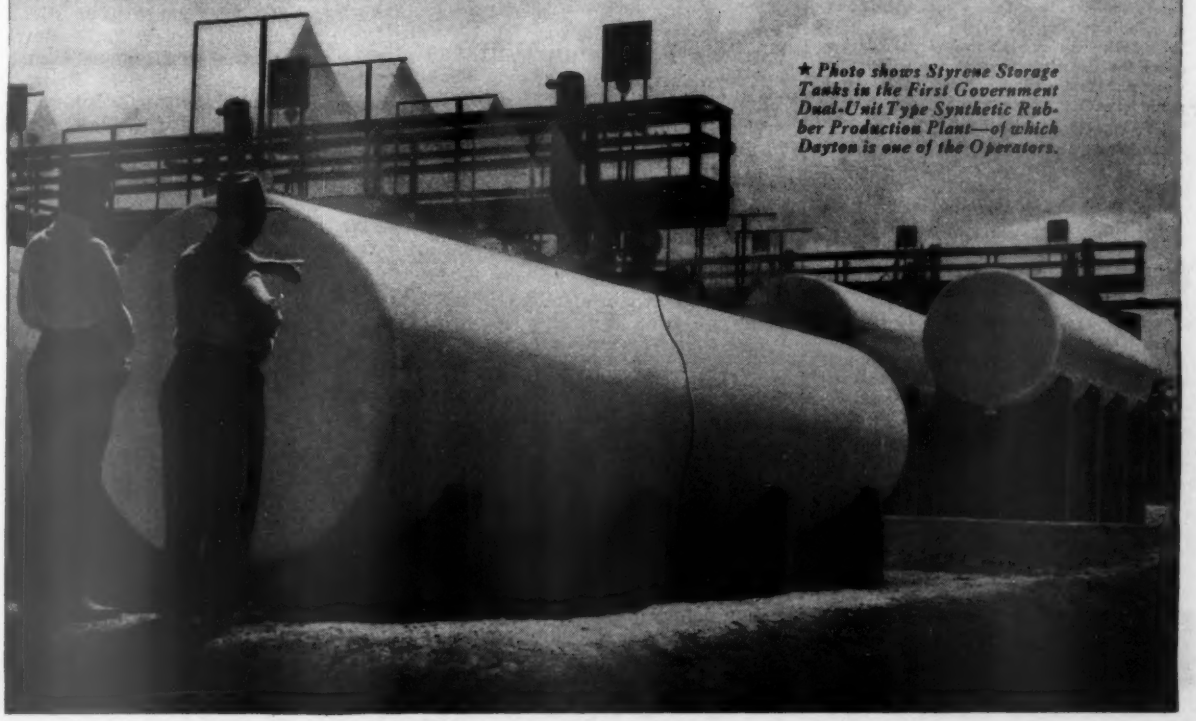

★ *Photo shows Styrene Storage Tanks in the First Government Dual-Unit Type Synthetic Rubber Production Plant—of which Dayton is one of the Operators.*

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STOODY TUBE BORIUM* KEEPS DITCHER TEETH SHARP ...ELIMINATES FREQUENT SHUT-DOWNS FOR TOOTH CHANGES...CUTS REPLACEMENT COSTS UP TO 75%

The two ditcher teeth pictured above were used on the same machine and operated under identical conditions.
The unprotected tooth at the top had to be sharpened every three days and was too short for further service after six sharpenings.
But the Borium-protected tooth at the bottom operated for 40 days and wore only ½". It was simply resharpened in the forge, retipped with Tube Borium, and put back on the ditcher for another 40 days' service.
Before the tooth was finally worn out, it had operated a total of 120 days!
Tube Borium makes such savings possible because the deposits represent the ultimate in wear resistance and the ability to cut hard earth formations.

*Stoody Tube Borium is supplied in rods of 1/8", 3/16", 1/4" and 3/8" diameters and is available for either oxyacetylene or D.C. electric application. Prices and specifications are yours for the asking.

These tungsten carbide particles do not melt when tube is applied but are held in suspension in a mild steel matrix forming a deposit resembling coarse sandpaper.

Send for free booklet on TUBE BORIUM, showing sizes and styles of rods and recommended methods of application.

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1138 West Slauson Ave., Whittier, Calif.

STOODY HARD-FACING ALLOYS
Stop wear... Eliminate Repair

PIPE LINES

WEP Ships Crude Through New Jersey Lateral

Crude oil was pumped October 10 into the 20-in. lateral of War Emergency Pipelines, Inc., extending from Phoenixville, Pa., to Linden, N. J. Pressure testing of the line has been discontinued. Early this week oil was moving at a rate of 140,000 bbl. daily but it is believed that normal shipments will be at a daily average of not more than 125,000 bbl. daily.

For the past 3 weeks crude-oil shipments from Longview, Tex., to Norris City, Ill., have averaged better than 310,000 bbl. daily. Throughput would have been greater if there had not been delays in receiving scheduled shipments at Longview. Tank-car shipments of 90,000 to 100,000 bbl. have been going eastward from Norris City. Sufficient valves are now on hand for completing stations of the eastward extension which will raise capacity of this leg from 225,000 bbl. to 300,000 bbl. daily.

With more than 1,275 miles of 20-in. laid for the WEP products line, only 200 miles remain to be laid to complete the project about November 20.

Warren Petroleum Will Lay 70-Mile System

Warren Petroleum Corp. will lay 70 miles of gas gathering system for a natural-gasoline plant near Hawkins, Tex. Pipe will range from 2-in. to 24-in. Contract has been let to Anderson Brothers. Work will be supervised from a field office at Hawkins. Laying will be done by one or two spreads which will start early in November.

Big-Inch to Cushion Postwar Tanker Rates

Because of low cost of transportation by the big-inch line there is no question as to its usefulness after the war is over, according to Wallace R. Finney, coordinator of pipe-line operations, and J. B. Adoue, pipe-line engineer, both of Standard Oil Co. (New Jersey) in the current issue of Mining and Metallurgy dealing with the War Emergency Pipelines, Inc., 24-in. crude-oil line.

"After the war," they say, "operation of tankers will, of course, provide the major capacity required along the Eastern seaboard, but the big-inch will be operated permanently. It will provide not only low-cost transportation, but will have the further beneficial effect of acting as a cushion on tanker rates, which in years past have fluctuated widely."

Stanolind Awards Contracts For 16-in. W. Texas Outlet

All contracts for laying the 385-mile 16-in. line from Slaughter station near Sundown, Tex., to Drumright station, Oklahoma, have been let with the exception of Job 6 for river crossings which will be awarded some time this week. Part of the work will start as soon as pipe arrives from National Tube Co. and A. O. Smith Corp. during the first 10 days of November. Deliveries of 4 miles of river pipe will be made earlier. Certain contractors do not expect to have their gangs organized before December.

Contracts have been awarded in sections averaging 70 to 75 miles, as follows: I. C. Little, Job 1, Slaughter station to a point between Floydada and Matador, Tex.; Sharman & Allen, Job 2, to the Red River; Midwestern Engineering, Job 3, to Carnegie, Okla.; Job 4 to a point between Britton and Edmond, Okla.; O. C. Whitaker Co., Job 5, to Drumright, Okla.

Emergency Pipe-Line Program Costs $256,000,000

WASHINGTON, D. C. — Pipe-line movement of petroleum products to the eastern seaboard has increased from 66,000 bbl. a day to more than 360,000 bbl. daily in the 2 years since July 1941, Petroleum Administrator Harold L. Ickes announced last week.

Mr. Ickes reported the sixfold increase in oil supplies would be doubled to 700,000 bbl. daily delivered to the East by pipe line in the early summer of 1944.

The petroleum administrator reviewed the whole pipe-line program in a progress report on current-oil movements. The $256,000,000 program embraces 18 projects of which 13 have been completed. The federal Government is contributing $187,000,000 to financing the pipe lines.

Total length of 18 authorized lines

is 7,257 miles, of which 5,721 miles has been completed. In addition, conversions to reverse the normal flow of oil in 3,303 miles of existing pipe have been completed.

Mr. Ickes said the pipe-line program will not guarantee immediate improvement in civilian-oil supplies on the East Coast as a very large proportion of the pipe-line deliveries will be shipped overseas to fighting fronts.

The principal industry-financed projects not yet completed are two outlets from the Permian basin of West Texas-New Mexico and a 250-mile products line from East Chicago, Ind., to Toledo, Ohio.

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Oil & Gas Building HOUSTON, TEXAS

Midwestern Engineers Announce Partnership

The new firm, Midwestern Engineers, Drew Building, Tulsa, is a partnership including F. E. Stanley, C. C. Bledsoe, Clyde Wyant, Norman V. Jones and B. L. Weller, all of whom were formerly with the firm of Midwestern Engineering & Construction Co.

Work being carried on by the organization consists of sleeving nine hundred 6-in. welds for Illinois Utilities Co. near Dixon, Ill.; surveying for Stanolind Pipe Line Co.'s 16-in. Slaughter, Tex. - Drumright, Okla., line and surveying part of Magnolia Pipe Line Co.'s Midland-Corsicana, Tex., line; rechaining 280 miles of War Emergency Pipelines, Inc., 24-in. line in Pennsylvania as well as transmission-line construction for several REA cooperatives. The firm of Stanley-Bledsoe Construction Co. is completing 61 miles of 24-in. after spending approximately 2 months on the job.

Rivers Advocates Texas-Virginia Line

DALLAS, Tex.—"Pipe lines built from Texas to carry oil and oil products during the war will not be permitted to be converted to gas lines after the war if I can prevent it," Rep. L. Mendel Rivers of South Carolina, chairman of the petroleum subcommittee of the House naval affairs committee, said here last week. Later, he issued a statement favoring a new line from the Houston, Tex., area to the Charleston, S. C., and Norfolk, Va., areas.

The cost of such a pipe-line system with laterals to the other important points, would be $80,000,000, according to A. K. Swann, attorney, assisting Mr. Rivers. It would require 400,000 tons of steel and 6 or 7 months to build.

"It would save the taxpayers $150,000 to $200,000 per day," Mr. Swann said, "now being paid in excess transportation costs on the quantity of oil which the line would transport, which would mean a minimum saving of $50,000,000 annually.

"The line would pay for itself in savings in 20 months and, in addition, from its earnings, would liquidate its cost in from 50 to 100 months, depending upon rates established."

Texas-New Mexico Surveys For Gathering Line

Preliminary survey has been made to lay a line to the new oil field being opened in southeast Andrews County, Texas, by Texas-New Mexico Pipe Line Co., to connect with the main line which lies about 10 miles east of the new pool.

14,000 MILES
Pipe Lines With
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Natural Gas

El Paso Natural Seeks Permit to Build Two Loops

WASHINGTON, D. C.—Application by El Paso Natural Gas Co. for permission to construct two loop lines in New Mexico and Arizona will be heard by representatives of the Federal Power Commission at Fort Worth, Tex., October 25.

According to the application designed as Docket G-472, the El Paso company proposes to build about 35.3 miles of loop line extending from the company's No. 4 compressor station in Luna County, New Mexico, and about 23.3 miles of loop line extending from its Morenci compressor station in Greenlee County, Arizona.

The order provides that interested state commissions may participate in the hearing.

Continuance Granted Ohio Fuel Gas Co. Hearing

The State Utilities Commission of Ohio continued from October 13 until November 16 its hearing on the citation of Ohio Fuel Gas Co., to stop furnishing stabilized gas instead of natural gas to its consumers in Columbus and several other Ohio communities. The continuance was granted at the request of the company.

Cabot Plea to Halt Service Rejected by Federal Board

WASHINGTON, D. C.—The Federal Power Commission last week denied Cabot Gas Corp. permission to abandon the service of natural gas from its 14-in. pipe line to its customers in New York and to abandon the transportation of natural gas for ultimate redelivery to Godfrey L. Cabot, Inc., its parent company.

Discussing the applicant's claim that if abandonment of service is not authorized they will not be able to meet the probable demands of their customers, estimated at 569,648,000 cu. ft. for the 12-month period ending April 30, 1944, the commission states "we believe the record fully justifies the conclusion that the aggregate of these estimates by the applicants is excessive by about 93,000,000 cu. ft.," and gives as its estimate a total of 484,542,000 cu. ft. of gas available to Cabot, Inc., to meet demands this winter. "The indicated production and purchases therefore exceed the estimated total demands for the period by 7,856,000 cu. ft.." the opinion points out. The commission, the opinion continues, estimates that Cabot, Inc., will have available a total of 484,542,000 cu. ft. of gas to meet this winter's probable demands of the Cabot Gas Corp.

Sour-Gas Production Increasing in Arkansas

EL DORADO, Ark.—The gas fields of North Central Arkansas produced on average of 10,395,000 cu. ft. daily in August, compared with 10,422,000 cu. ft. daily in July.

Only production increase noted was in the sour-gas areas and from the condensate pools of South Arkansas, with a daily yield averaging 11,436,000 cu. ft. more in August than in July. Production listed for the 2 months on an average daily basis was July, 123,914,000 cu. ft., and August, 135,260,000 cu. ft.

South Arkansas' 10 gasoline plants processed an average of 127,195,000 cu. ft. of gas daily during August, increasing 10,141,000 cu. ft. from the 117,054,000 cu. ft. handled daily in July. During August 2,653 bbl. of gasoline, 1,466 bbl. of butane, and 19 bbl. of condensate were manufactured at these plants each day.

Texas Sets Allowable for Rodessa Gas Production

AUSTIN, Tex.—Allowable production of natural gas from the Texas portion of the Rodessa field was set at 34,789,032 cu. ft. daily for October in an order issued last week by the Texas Railroad Commission.

Total October allowable of 1,078,460,000 cu. ft. is divided among three pays as follows: Dees Young sand, 176,940,000 cu. ft.; Gloyd sand, 753,477,000 cu. ft., and Hill sand, 148,043,000 cu. ft.

Lone Star Applying for United Gas Connection

WASHINGTON, D. C.—The Federal Power Commission set hearing at 9:45 a.m., October 21, in Room 520, Civil Service Examination Room, United States Courthouse Building, Fort Worth, Tex., on applications filed by the new Lone Star Gas Co.

Lone Star is seeking certificates of public convenience and necessity under the Natural Gas Act to acquire and operate the properties of its predecessor in interest, the old Lone Star Gas Co. and to construct and operate a pipe-line connection between the Lone Star Co.'s 16-in. gas pipe line and the United Gas Pipe Line Co.'s 10-in. line near Fort Worth.

EXECUTIVE BOARD OF AMERICAN GAS ASSOCIATION

Seated, left to right: Col. Hudson W. Reed, C. M. Cohn, James A. Brown, Alexander Forward, President A. F. Bridge, Vice President E. R. Acker, W. C. Beckjord, Treasurer J. L. Llewellyn, D. W. Harris, Major T. J. Strickler. Standing: Randall J. LeBoeuf, E. J. Boothby, John W. Batten, B. H. Gardner, E. P. Noppel, C. A. Tattersall, C. F. Turner, L. A. Mayo, W. E. Derwent, Kurwin R. Boyes, C. V. Sorenson, G. S. Hawley, E. J. Tucker, H. L. Gaidry, Burt R. Bay, H. N. Mallon

Exploration and Drilling

Week's Highlights

AN abnormally large number of wildcat tests are reported as possible producers this week, although none of them appear to be major pool openers. Mississippi leads the field with three discoveries near completion and a showing of oil in a second sand in one of its prospective pools. The three new producing spots lie on a broad arc extending completely across the state, which arc also includes the Tinsley and Pickens-Sharpsburg producing fields (p. 106). The California Co.'s Adams County discovery marks the extension of the Wilcox trend across the Mississippi River from Louisiana and will enable wildcatters to project it still farther into the state. The importance of the Tuscaloosa discovery on the Alabama State line, in Wayne County, has already been stressed, but the fact that Eutaw production has also been found in this area gives operators another mark at which to shoot. The Eutaw is the principal pay in the other fields in the state and this test nails down a possible trend which may extend well into Alabama.

In coastal Louisiana, the importance of the Reddell distillate discovery in Evangeline Parish is enhanced by reports from another test about 1 1/4 miles to the west that gas-distillate has been found in the same two pays as in the discovery. The second well is higher than the discovery (p. 96).

Still farther to the west, three discovery wells were completed and possibilities are reported in an extension test in the Wilcox producing zone at West Tuleta, in Bee County (p. 93).

In North Central Texas, the Mississippi lime yielded 70 bbl. on a 1-hour test in Stephens County, while a new Ellenburger area is being opened up in Archer County west of Hull-Silk (p. 100). Elsewhere in Texas, wildcatting activity is on the increase as shown by a large number of locations in the eastern and western sectors.

In the eastern states, there were McClosky lime discoveries in the north-central part of the Illinois basin (p. 92) and Indiana, and a Union County, Kentucky, wildcat is showing oil in the Aux Vases (p. 94). The most active area in the Appalachian district is at the southern end of the Clinton belt in Ohio. Here the area west of Zanesville has yielded an oil discovery in an area in which two gas wells indicate the existence of a large gas cap in the new pool.

News from the northern Mid-Continent is almost completely confined to gas. The second well in the Belpre pool, Edwards County, Kansas, has blown in as a large gasser (p. 100) and in Oklahoma gas was found in a test west of the old Ingalls area in Payne County and in the Edmond field, a well in process of abandonment has also blown in as a big gasser (p. 106). Also in the Edmond district, the importance of the Upper Paleozoic trend to the west of the fields on the Nemaha buried ridge was emphasized by showings in a wildcat north of the West Edmond pool. These pools suggest the possibility that even farther out from the prolific Wilcox sand fields, there may be another trend from which the truncated Mississippi lime will provide additional production.

The success of recent prospecting in the deep pays of Wyoming has caused a revival of interest in many structures whose existence has been known for years. Some of these have had a long record of production from upper sands but were never tested at depth because of the lack of interest in the heavier oils expected. Today that factor has disappeared. The oil is wanted and operators are cashing in on the many years of geological work that they have done in the area (p. 96).

COMPLETIONS IN ALL FIELDS . . .

(Week ending October 9, 1943)

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1943	Total Comp. to date 1942
N. Y., Penna., W. Va.	48	17	7	72	122,982	2,648	2,646
Ohio	8	9	8	25	57,654	702	677
Indiana	3	0	1	4	7,048	175	261
Kentucky	2	3	6	11	21,242	328	155
Illinois	25	1	14	40	100,737	1,347	1,350
Michigan	4	0	12	16	37,680	483	547
Kansas	18	1	19	38	114,910	1,273	1,212
Nebraska	0	0	0	0	0	24	29
Missouri, Iowa	0	0	1	1	630	13	11
Oklahoma	7	1	7	15	52,944	921	933
Texas:							
North Central Texas	14	0	8	22	72,409	1,114	883
West Texas	21	0	1	22	107,838	675	1,092
Texas Panhandle	4	0	0	4	12,019	137	283
Eastern Texas	6	1	2	9	54,265	225	312
Texas Gulf Coast	7	0	5	12	73,911	352	553
Southwest Texas	15	2	8	25	129,834	709	926
Total Texas	67	3	24	94	271,455	3,212	3,929
North Louisiana	8	0	3	11	33,543	243	373
Louisiana Gulf Coast	4	3	2	9	72,897	278	381
Total Louisiana	12	3	5	20	106,440	521	754
Arkansas	2	4	5	11	46,986	193	135
Mississippi and Southeast	1	0	4	5	23,477	69	46
Montana	3	1	2	6	12,177	172	156
Wyoming	5	0	1	6	23,154	110	83
Colorado, Utah	0	0	1	1	4,454	19	17
New Mexico	7	0	1	8	22,107	175	188
California	23	1	19	43	158,197	1,025	566
Total United States	235	44	137	416	1,184,284	13,388	13,895
Total previous week	194	33	132	365			
Week ending Oct. 10, 1942	183	44	96	323			

CALIFORNIA

Dry Hole Defines West Raisin City Oil Zone

LOS ANGELES, Calif.—Shell Oil Co., Inc., defined the productive limits of the Eocene oil sands in the West Raisin City field as its northern outpost in 10-15s-17e, found the Eocene wet at 6,346-76 ft. This well, 1-1 San Joaquin, was successfully completed as a gas well in the overlying Miocene after being plugged back to 5,020 ft. Seaboard, Union and Associated have their second well in the West Raisin City field on top of the Eocene pay and should have it ready for a production test within the next 10 days. Only one oil well has been finished in the West Raisin City field and since it only produced from a relatively thin Eocene sand the well now being drilled will be watched with interest to see if it opens up more oil sand.

LOS ANGELES BASIN

Los Angeles County.—Texas Co. has spudded its projected deep test in the Long Beach field and within another 60 days should be able to determine whether this remarkable old field will get another chance to gain importance. Deep zone production has already been developed at Long Beach but in each case to date the zone has not shown any great kick and the sand is very tight. The objective of this deep test, 1-D Fields, is the De Soto zone, but if this horizon should fail to yield good flowing production, it is the present intention of drilling ahead for a conclusive deep test.

COASTAL DISTRICT

Ventura and Santa Barbara Counties.—General Petroleum Corp. has under consideration the drilling of several additional wells from its Ferguson pier in the Rincon field and will probably begin drilling at least one new well within the next few weeks. There are several undrilled locations available for work and while these wells do not yield large production they are commercially productive. This projected drilling is of interest because of the possibility the State Lands Commission may throw open the Rincon tidelands for development in the not far distant future. Because of the existence of its 1,200-ft. drilling pier, General Petroleum Corp. should be in a good position to take advantage of any such decision. There was at one time a drilling island at Rincon but it was demolished several years ago due to the terrific pounding of the surf after the well which it contained had been abandoned. The steel island was built in order to permit development of the Rincon tidelands and ingress and egress was by boat.

CALIFORNIA WILDCAT COMPLETIONS

Belridge district, Kern County: Kohlbush & Lyons 1 U.S., 6-29s-22e, abandoned in gray sand, T.D. 1,509 ft., no oil showings of importance found.

Camarillo district, Ventura County: Allied Prop. Inc., 2 Camarillo, 4-1n-20w, abandoned in basalt, T.D. 148 ft., no showings found.

Forest Lake district, San Joaquin County: Amerada 1 Thompson-Folger, 3-4n-6e, abandoned in gray sand, T.D. 3,500 ft., form. test 2,411-72 ft. recovered 150 ft. mud, 140 ft. water and sand, Capay shale 2,795 ft., Capay sand 2,965 ft.

Las Llajas district, Los Angeles County: Western Gulf 1 Brady Estate, 13-3n-17w, abandoned in gray sand at low structural position, T.D. 9,807 ft., test of upper showings negative, bottomed in Miocene.

Lost Hills district, Kern County: Union 8-11 Ellis, 11-27s-21e, abandoned in gray sand and shale, T.D. 3,997 ft., nothing of importance logged.

Mount Poso district, Kern County: F. K. Gill, 1 Young, 30-27s-28e, abandoned in gray sand, T.D. 2,637 ft., grit zone 2,603 ft., cored 6-in. spotted oil sand in Vedder of Miocene age at 2,613 ft., and 1 ft. at 2,627 ft., insufficient oil sand to produce.

Raisin City West, Fresno County: Shell 1-1 San Joaquin, 10-15s-17e, flowed 2,400,000 cu. ft. gas, no oil, 16/64-in. bean, pressures 1,800/900 lb., T.D. 6,376 ft., in Eocene, P.B. 5,020 ft. to Miocene, perf. 4,925-5,020 ft. This is first gas well in this new oil field, gas sand is probable equivalent of Shell gas zone in East Raisin City field.

Winchester Lake district, Yolo County: Texas 6-1 Winchester Lake, 20-7n-4e, abandoned in gray sand and shale, T.D. 5,416 ft., had high head water high up in hole, no important showing of oil or gas logged.

DAILY AVERAGE PRODUCTION FOR WEEK

	Oct. 9 crude oil	Distillate, allied products	Oct. PAW quota all oils	Oct. 2 crude oil
Arkansas	78,450	4,000	81,700	76,600
California	769,500	46,000	832,000	773,400
Colorado	7,000	.....	7,000	7,150
Eastern fields	78,100	6,000	87,200	75,200
Illinois	235,000	11,500	219,500	215,500
Indiana	14,100	.....	13,800	14,450
Kansas	265,600	4,900	300,000	272,250
Kentucky	22,675	2,200	26,600	24,720
Louisiana	360,525	27,000	375,700	360,000
North Louisiana	81,525	.....	.....	81,500
Louisiana Gulf Coast	279,000	.....	.....	278,500
Michigan	54,700	100	59,100	56,400
Mississippi	47,570	.....	50,000	49,000
Montana	25,400	300	23,400	22,560
Nebraska	1,750	.....	1,800	1,800
New Mexico	109,000	5,400	116,600	109,000
Oklahoma	326,850	27,000	345,700	325,800
Texas	1,891,900	116,000	1,999,000	1,838,150
East Texas	368,700	.....	.....	380,000
West Texas	354,050	.....	.....	333,500
North Central Texas	138,300	.....	.....	140,000
East Central Texas	135,250	.....	.....	131,200
Texas Panhandle	88,100	.....	.....	104,000
Texas Gulf Coast	708,350	.....	.....	654,800
Southwest Texas	99,150	.....	.....	94,050
Wyoming	101,850	2,000	99,600	102,975
Total United States	4,389,970	252,400	4,638,700	4,324,955

Total production January 1-October 9, 1943 ..... 1,137,059,090 bbl.
Same period last year ..... 1,096,528,735 bbl.

EASTERN TEXAS

Many Tests Seek Deeper Pays in Basin

DALLAS, Tex.—Exploration for deeper production continues at a brisk pace in the Eastern Texas district. In addition to the 10 active deep drilling wildcats in the district, new locations are being made every week for Paluxy sand tests, or deeper horizons. In Hopkins County, 3½ miles east by north of Sulphur Springs, J. C. Benedum will drill a Travis Peak test on the J. C. Spencer farm in the John O. Holbert Survey, about 9 miles southwest of the Sulphur Bluff pool. In Panola County, Rogers Lacy 1 Frost Lumber Co. is a new Cotton Valley test, 4 miles northwest of Deadwood. A Paluxy sand test will be drilled in Van Zandt County, 6½ miles west of Van, by Bronstein & Seigel as their 1 F. L. Loftis. Two and one-half miles west of Flag Lake, western Henderson County, Fohs Oil Co. 1 E. P. Harwell is a new Woodbine test located in the Henry Jeffers Survey. In Anderson County, 18 miles northwest of Palestine near the Trinity River, V. J. Meyer 1 P. D. C. Ball estate is to be a 6,000-ft. test in the Muriana Riva Palacious Survey.

EAST TEXAS WILDCAT COMPLETIONS

Rusk County: Beacon Oil & Ref. 1 J. H. Allen est., 660 ft. from N, 660 ft. SW of road, or 2,100 ft. from W, 2,275 ft. from N Taylor Brown Sur., 4 mi. NW of Henderson, elev. 437 ft., flow 231.84 bbl., ¼-in. choke, Pettit lime pay 7,250-64 ft., perf. 140 shots 7,250-64 ft., acid 1,000 gal., P.B. to 7,270 ft. from T.D. 7,503 ft. Discovery.

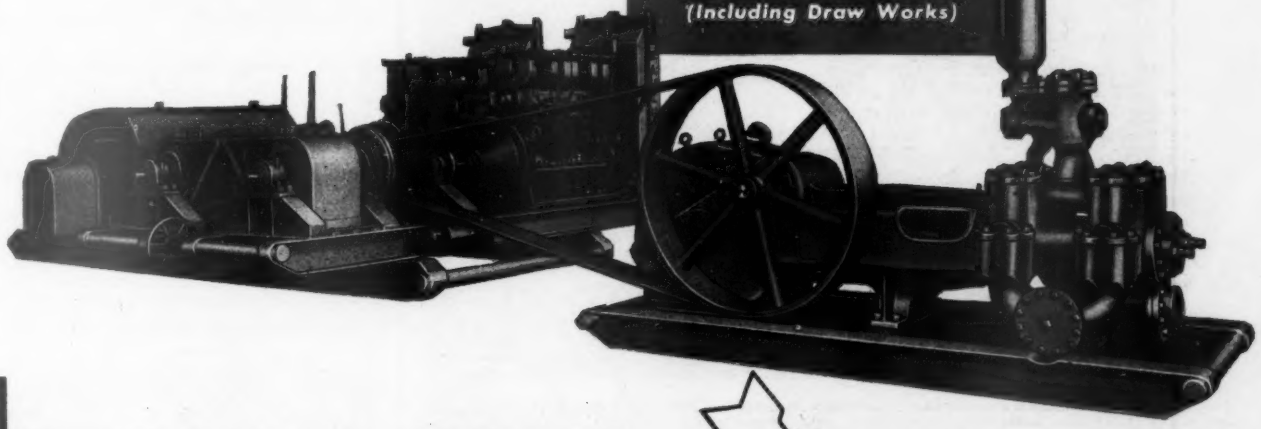
Panola County: Rogers Lacy 1 Burnett Bros., O.W.W.O., 2,900 ft. E of E line, J. D. Oliphant Sur., 787 ft. N of N line, John McPhale Sur. but in S. B. Hendricks Sur., 6 mi. W of Furrh, I.P. 7,500,000 cu. ft. gas, pay 6,081-6,250 ft., P.B. to 6,255 ft. from T.D. 6,509 ft. Discovery.

GUMBO BUSTER'S

MODERN ROTARY DRILLING EQUIPMENT

The MC-350 DRAW WORKS

The MC-350 MECHANICAL RIG
(Including Draw Works)



HERE'S rotary drilling efficiency at its peak — the Gumbo Buster MC-350 Mechanical Rig, including the MC-350 Unit Draw Works, the Rotating Elements and the Engines. Rated capacity of this modern, streamlined, easily portable rig is 350 to 400 h.p. Recommended drilling depth is 6500', using 4½" A.P.I. drill pipe and 6 lines. V-belt rotating elements are mounted on separate skid units with the necessary V-belts and pulleys to connect the two engines together and to the draw works and pump.

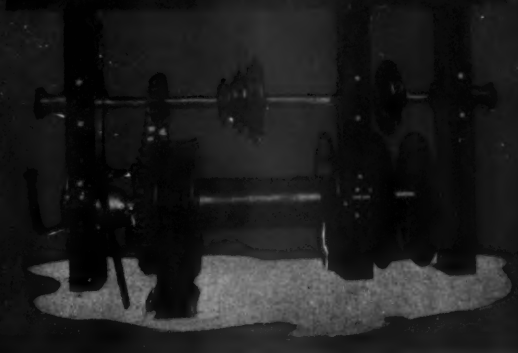
The Gumbo Buster MC-350 Draw Works, illustrated here as a part of the entire rig, and above as a separate unit, has 6 speeds to the drum and 3 speeds to the rotary. It has fully enclosed oil bath chain transmission with heat treated cut sprockets and roller chains, and friction clutch on master clutch, drum and rotary drive.

Behind this modern, dependable rig is 42 years of sound experience in designing, building and proving rotary drilling equipment. As evidence, we present Gumbo Buster's 1901 Model Draw Works, with its 3-3/16" line shaft, 3-15/16" drum shaft, single brake band with hickory wood brake band lining, and (believe it or not) friction clutch. It weighed 5000 pounds and sold for $250.00.

Gumbo Buster also manufactures two smaller mechanical drilling rigs. The TD-150, for 3,000' drilling, and the MC-250, for 5,000' drilling.

Full details upon request—or in the new edition of the Composite Catalog, coming off the press soon

IS THE OUTGROWTH OF THIS 1901 MODEL DRAW WORKS



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PERMIAN BASIN

Wildcat Activity Showing Considerable Increase

MIDLAND, Tex.—New wildcat locations featured the development in the West Texas district the past week. In Yoakum County, 2 miles north of nearest production in the Wasson field, Paul G. Schaeffer will drill 1 Mattie E. Farmer, C SW SW Section 635, Block G, J. H. Gibson Survey, with the regular Wasson pay as the objective. Another wildcat for the north end of the Permian basin is E. Constantin, Jr. et al 1 G. W. Moore, SW SW Labor 9, League 64, Midland County School Land, 1 mile southwest of Whiteface, and 2½ miles northeast of the Sunray-Wright discovery, 5 miles north of production in the Slaughter pool. A new test on the east side of the south part of the Wasson pool will test the Clear Fork horizon, being scheduled to go 7,800 ft. if necessary. It is Bay Petroleum Co. 2 T. A. Blair, NW NE SE Section 39, Block AX, Public School Land, and falls 3 miles east of the two Clear Fork producers in Section 50.

In the south part of the basin, new tests are located in Upton, Crockett, Pecos and Howard counties.

WEST TEXAS WILDCAT COMPLETIONS

Pecos County: Anderson-Prichard 1 Weir, 660 ft. from N, 660 ft. from W, Sec. 14, Blk. 140, T.&St.L. Ry. Sur., dry, T.D. 4,815 ft.

SOUTHEAST NEW MEXICO

HOBBS, N. M.—An effort to spread production on the southeast side of the Maljamar pool of Lea County will be made by Williams Oil Co. 1 Williams-State, NE NE Section 31-17s-33e, which falls about ½ mile south of production and the same distance southwest of the recent extension area. Production test will be made at Olsen Oil Co. and Atlantic Refining Co. 1 Langlie, Ordovician failure in 11-25s-37e, through perforations from 4,835-80 ft. The wildcat encountered granite at total depth 9,594 ft. several months ago, and has been testing several shows up the hole.

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ILLINOIS

Pool Opened in Effingham; Good Wells in Old Areas

CENTRALIA, Ill.—C. E. Stout opened a pool in Effingham County in the past week with 1 Bushire, C SW NW 16-6n-6e. The well swabbed 210 bbl. in 24 hours from McClosky lime, but later pumped 338 bbl. of oil and 15 bbl. of water in 30 hours.

Texas Co. completed a 614-bbl. well in the Maple Grove pool in Edwards County, 1 Gillespie-Shelby in C E½ SE NE 9-1n-10e, producing from McClosky lime at 3,275-79 ft.

Gulf Refining Co. added a good well to the Bogata pool in Jasper County, opened in August, with its 1 Mark Heap, SE NE SW 28-6n-9e, two locations south of the Big Chief discovery well which started at 152 bbl. from McClosky lime topped at 3,109 ft. The Gulf's well flowed 612 bbl. in 24 hours from McClosky lime at 3,108-16 ft., T.D. 3,126 ft.

The National Associated Petroleum Co. has a 300-bbl. completion in 1-A Rebstock, SW SW NW 26-4s-7e, in the recently-opened Bungay pool in Hamilton County. The well produces from Aux Vases sand at 3,303-13 ft. A small percentage of water was showing with the oil.

ILLINOIS WILDCAT COMPLETIONS

Effingham County: C. E. Stout 1 Bushire, C SW NW 16-6n-6e, swabbed 210 bbl. first 24 hours from McClosky lime at 2,564-68 ft., 2,591-99 ft., acidized. Later pumped 202 bbl. of oil and 13 bbl. water in 13 hours; 338 bbl. oil and 15 bl. of water in 30 hours, then 245 bbl. of oil and 24 bbl. of water in 24 hours. A pool opener.

Jefferson County: K. M. Boyer 1 Kiefer, SE SE NW 20-4s-4e, dry at 3,303 ft. Upper Kincaid 1,970 ft., Cypress 2,807 ft., Aux Vases 3,115 ft., McCloskey 3,213-19 ft.

Marion County: Magnolia 1 E. White, C SW NE 25-1n-3e, dry at 2,836 ft., McClosky lime 2,753-57 ft.

Montgomery County: Central P. L. 1 Frank

Gees, NW NE SW 35-11n-5w, dry at 2,467 ft. Fredonia lime 804 ft., Burlington 1,460 ft., Louisiana 1,752 ft., Chattanooga 1,802 ft., Devonian 1,852 ft., Silurian 1,955 ft., Maquoketa 2,196 ft., Trenton 2,404 ft.

Perry County: Big Chief 1 Knox Gee, SE SW SW 26-4s-1w, dry at 1,673 ft. Base of Pennsylvanian 750 ft., Cypress 1,196 ft., Benoist 1,383 ft., Aux Vases 1,462 ft., St. Louis 1,666 ft.

Saline County: J. H. Gilliam 1 Sisk, SE SE NE 15-10s-6e, 500,000 cu. ft. of gas. Waltersburg sand 1,490-1,500 ft. T. D.

White County: N. V. Duncan 1 McCarty, C NE NE 1-6s-9e, dry at 3,241 ft. Base of Pennsylvanian 1,914 ft., Cypress 2,792 ft., Benoist 2,920 ft., Aux Vases 3,016 ft., McClosky 3,125-35 ft.

SOUTHWEST TEXAS

Three Pool Openers and One New Sand Discovery Gaged

CORPUS CHRISTI, Tex. — The search for new oil reserves continued unabated in the Southwest Texas district as operators in that area announced locations for more than a dozen widely scattered wildcat tests.

Jim Hogg County.—The Armstrong field discovery, Texas Co. 1 Louis Armstrong, northwestern part of the county, 7¼ miles southwest of Hebbronville, flowed a potential of 317 bbl. daily on 20/64-in. choke from the Loma Novia sand at 3,247-55 ft., total depth 3,260 ft.; 5½-in. set at 3,242 ft.; tubing pressure, 80 lb.; casing pressure, 350 lb.; gravity, 37.1; no water.

Bee County. — Pure Oil Co. 1 Tom Williams, discovery Vicksburg producer of the Blanconia field, gaged 55 bbl. daily on 10/64-in. choke from sand at 4,960-77 ft. in open hole below the 5½-in. casing set to 4,960 ft. Tubing pressure was 1,735 ft., casing pressure 735 lb., gravity 25, no water. This oil discovery is ½ mile east of the company's 1 Tuttle gas discovery well, being in the Michael O'Donnell Survey.

A major extension is indicated at the West Tuleta-Wilcox field, where Mills Bennett, Anderson-Prichard and Union Producing Co. are setting casing near bottom at total depth 7,760 ft. in the 1 Imogene Hall. Sands capable of producing were reported but details are not available at this time.

Live Oak County.—Another Southwest Texas discovery on which final gage was reported was Henderson Couquat's 1 Mrs. Minerva Coquat, discovery well of the Coquat field. With total depth 8,030 ft., producing from perforations 7,462-68 ft. in top of a Wilcox sand at 7,462-83 ft., it made 31.75 bbl. daily through ⅛-in. choke, gas-oil ratio 44,540-1, tubing pressure 1,750 lb., casing pressure 1,800 lb., 49-gravity oil, no water.

Starr County. — Sun Oil Co. 3-C Isabel V. Montalvo flowed 166.27 bbl. daily through 9/64-in. choke on potential test, completed in a new sand for the North Sun field, showing tubing pressure 860 lb., casing pressure 1,175 lb., no water, gas-oil ratio 603-1. Production is from perforations 5,105-10 ft., total depth 5,147 ft. This new well is south of previous production.

LOWER GULF COAST WILDCAT COMPLETIONS

Bee County: H. E. Dirks et al 1 George W. Goree, 3 mi. W of Mineral test, dry at 7,113 ft.

Pure Oil Co. 1 Tom Williams, 11 mi. NW of Refugio, ½ mi. E of 1 Tuttle discovery gas well at Blanconia, 55 bbl. a day 10/64-in. choke, T.P. 1,735 lb., C.P. 735 lb., G.O.R. 7,780-1, grav. 25, no water, 428,000 cu. ft. gas day, top Vicksburg oil pay 4,952 ft., T.D. 4,977 ft.

Texas Co. 1 Bolland Bros., 2 mi. NW of Clareville, dry at 5,454 ft.

Hidalgo County: Texas Co. 1 American Investment Corp., 6 mi. N NW of Mission, dry at 7,463 ft.

Jim Wells County: W. L. Goldston 3 Reed & Lindsay, 1 mi. N of Alice field, 1 mi. W of East Alice field, dry at 5,400 ft.

San Patricio County: Butcher-Arthur, Inc., 1 T. A. McKamey et al, 2 mi. N of Gregory, dry at 6,500 ft.

SOUTH TEXAS WILDCAT COMPLETIONS

Jim Hogg County: Texas Co. 1 Louis Armstrong, 3 mi. S SW of Yaeger field, 317 bbl. a day 20/64-in. choke from Loma Novia sand 3,247-55 ft., T.P. 80 lb., C.P. 350 lb., gravity 37.1, no water, T.D. 3,260 ft. Discovery Armstrong field.

Live Oak County: Henderson Coquat 1 Mrs. Minerva Coquat, 1½ mi. E SE of Goebel field discovery, 31.75 bbl.

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day 3/16-in. choke, from Wilcox sand 7,462-83 ft., in perfs. 7,462-68 ft., T.P. 1,750 lb., C.P. 1,850 lb., gravity 49, no water, G.O.R. 44,540-1. Discovery well Coquat field.

SOUTH CENTRAL TEXAS WILDCAT COMPLETIONS

Caldwell County: Marts & Beaven, Inc., 1 Brite Heirs, ½ mi. NE of Taylorsville, dry at 3,075 ft.

OHIO, KENTUCKY

New Clinton Sand Oil Pool Opened Near Zanesville

ZANESVILLE, Ohio. — A 106-bbl. well was completed by Brendel on the White tract, 1 mile southwest of the discovery well on the Johnson farm west of Zanesville. Forty-three feet of Clinton sand was found at 3,475-3,518 ft. with some gas in the top. Brendel has drilled 12 ft. in the sand and shut down on their Everett well ½ mile north of their White well, and have 1,790,000 cu. ft. of gas. H. K. Porter Co. completed a gas well gaging 744,000 cu. ft. on the Dearth tract 1 mile northeast of the discovery well with the gas found in the top of the sand, but no oil in the bottom. A considerable volume of gas overlying the oil in this pool is now indicated.

The Wheeling pool was extended ½ mile to the south by the Ohio Fuel completion on the Ingram tract in Section 5, Liberty Township. The well gaged 1,640,000 cu. ft. in the Oriskany sand at 3,262-3,273 ft. Locations south and east of this well will be staked.

Atha completed a small oil well 1 mile north of the Clayton pool in Section 28, Madison Township, which indicates an extension of the pool. The well will be offset to further test the area.

OHIO WILDCAT COMPLETIONS

Lorain County, Penfield Township: Pittsburgh D. & G. 1 John Vintela, Lot 55, Clinton, 2,563-67 ft., dry, T.D. 2,579 ft.

Perry County, Clayton Township: Ohio Oil 1 H. F. Teal, Sec. 33, Clinton, 3,361-3,401 ft., dry, T.D. 3,505 ft.

INDIANA

EVANSVILLE, Ind.—Four oil wells and one dry hole were completed in Indiana in the past week. The best of the small crop in the proven fields was a 99-bbl. well of Cherry & Kidd in SW SW NW 2-4s-14w, Posey County, producing from McClosky lime at 2,916-22 ft. It was 1 Mrs. William Gray, trustee.

INDIANA WILDCAT COMPLETIONS

Cherry & Kidd 1 Esther Leonard, NE SW NW 21-8s-14w, 150 bbl. McClosky lime 2,566-80 ft., T.D. 2,729 ft.

WESTERN KENTUCKY

OWENSBORO, Ky.—Sohio, Basin Drilling and Evans' wildcat in Union County, 1 B. Boswell, 3 miles northwest of Spring Grove, is opening a pool. A 30-qt. shot in Aux Vases sand at 2,732-62 ft., followed by swabbing, developed a 9-bbl.-per-hour production. Four dry-hole wildcats were completed in Henderson County.

Sun Oil Co. 3 Byron Tapp in Union County was good for 950 bbl. the first day from Levias lime at 2,502-11 ft., total depth 2,534 ft., and H. H. Weinert completed a 200-bbl. well in 5 George Greenwell in the same area in McClosky lime at 2,550-58 ft.

WESTERN KENTUCKY WILDCAT COMPLETIONS

Henderson County: Carter Oil 1 W. W. Agnew, 2 mi. S of Anthoston, dry at 2,567 ft., Glen Dean 1,816 ft., Barlow at 2,089 ft.

Ashland 1 C. C. Sheffer, dry at 2,743 ft.

Snowden & McSweeney 1 A. Alexander, 1 mi. S of Alzy, dry at 2,798 ft., Glen Dean 2,029 ft., Ste. Genevieve 2,591 ft.

Cherry & Kidd and Frontier 1 William P. Cooper, dry at 2,736 ft., Menard 1,739 ft., Cypress 2,313 ft., Ste. Genevieve 2,554 ft.

APPALACHIAN FIELDS

Pennsylvania Deep Test Finds Oriskany Dry

PITTSBURGH, Pa. — In Mercer Township, Butler County, Manufacturers Light & Heat Co. topped the Onondaga chert at 4,710 ft. in the test on the J. W. Hockenberry farm and the Oriskany at 4,825 ft. The Oriskany sand was not expected to be present in this location but to have been pinched out or to have feathered out yet there was at least 19 ft. of sand which was entirely dry. It is drilling at 5,200 ft. and the Newburg is the next producing horizon.

Westmoreland County. — In North Huntington Township, Peoples Natural Gas Co. struck a large volume of gas in 1 George E. Painter either in the bottom of the Hundred-foot sand or the top of the Thirty-foot sand. It gaged above 8,000,000 cu. ft.

In Ligonier Township, New Penn Development Co., William E. Snee et al bottomed the deep wildcat on the John and Eleanor Beck farm at 9,000 ft. and are abandoning it as a dry hole.

WEST VIRGINIA

Tucker County.—In Dry Fork district, the deep test of Ohio Oil Co. on the Kaemmerling tract completed running 5½-in. casing by the tools sidetracked near the bottom of the hole. Steel-line measurement of the string was 7,777 ft. It was cemented, shutting off the gas below the tools in the sidetracked hole. The gas had then reduced to about 150,000 cu. ft. from the original 700,000 ft. before the tools became lodged in the hole. Drilling will be resumed in about 1 week and it is believed to be near or on top of the Onondaga (Corniferous) chert. It will be a most important test.

TEXAS GULF COAST

Liberty County Wildcat May Open New Field

HOUSTON, Tex. — Opening of new oil production in Liberty County, about 6 miles south of Devers, was expected as William Helis began testing operations at his 1 Hirsch estate wildcat in T.&N.O. Survey, Section 27. Total depth is reported around 8,210 ft. with casing set to 8,100 ft. Working tanks and storage tanks were erected on the lease before starting to test.

Activity in the Texas upper Gulf Coast area showed a sharp upturn from the previous week when new work had dropped to only three new locations. The week just ended produced 16 new tests in the district, including some very important wildcats. Over on east side of the Texas coast Wilcox trend, Humble located 1 Denman Kountze et al, Emily Smyth Survey A-792, a mile northeast of Rockland and southwest of the Rockland field, contracted to 8,500 ft. which will carry it deep into the Wilcox which comes in around 3,600 ft. in this area. Gulf spotted 47 Sarah F. Wing et al, 9,000-ft.-south extension test at Segno in Polk County, and Gulf also located 22-C Kirby Lumber Co. et al, John Pleasants Survey A-327, 12,000-ft. Wilcox test in the old Cleveland area of Liberty County. Phillips Petroleum Co. will drill another test on the west side of the Chocolate Bayou field, Brazoria County, the 1 Mrs. Lula Allen, 1,500 ft. from the southeast and 1,600 ft. from the southwest lines of Section 6, H.&W. Survey. Rowan Drilling Co. et al made first location in Rowan field in many months, the 1-B Bradbury-Broussard-Hodnett-Burgess "B" unit, Section 4. This area was just recently unitized.

Galveston County. — Some interest is being shown in the Algoa area where Jack Frazier, Ray Ranger and Weber Ogden's 1 C. L. Cooper, just northeast of Algoa townsite, in I.& G.N. Survey, Section 13, is credited with sand showing oil 7,955-60 ft. and sand and shale showing oil 8,035-40 ft. The test was drilling ahead below 8,540 ft.

TEXAS GULF COAST WILDCAT COMPLETIONS

Brazoria County: E. Cockrell 1-A Seaburn Est. heirs, 10 miles S of Angleton, dry at 1,050 ft.

Jefferson County: Texas Co. 1 S. D. Barnes et al, North Fannett area, junked and abandoned 8,370 ft. in sidetracked hole.

Tyler County: Humble Oil & Ref. Co. 1-B Goolsbee; Wilcox wildcat 3 mi. NW of Warren townsite, dry at 8,428 ft.

San Jacinto County: Shell Oil Co., Inc. 1 E. N. Turner, deep test northwest side Mercy field, dry at 11,807 ft.

Wharton County: Edwin Nielsen et al 1 G. C. Duncan, 2½ mi. S of Lissie, dry at 7,143 ft.

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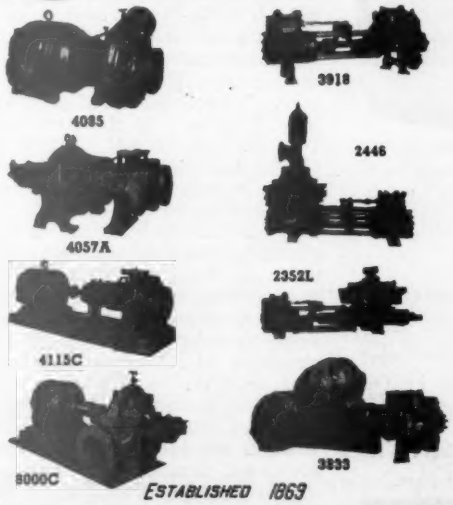

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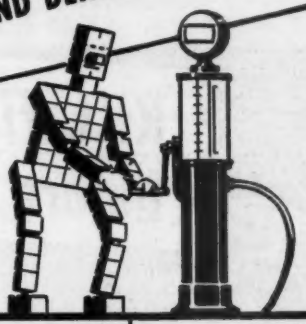

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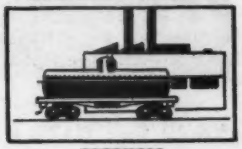
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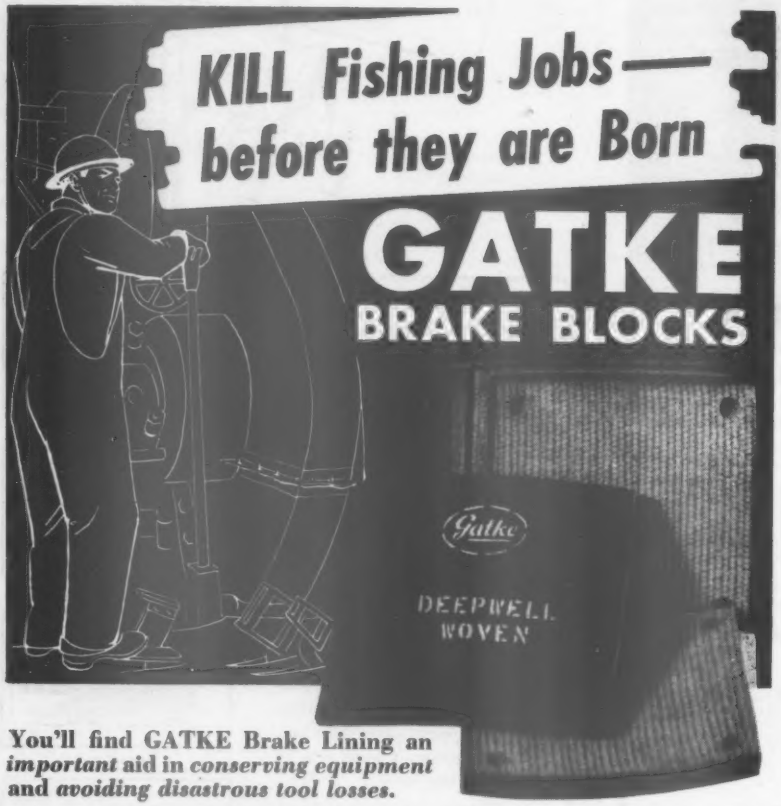
LOUISIANA GULF

Second Test on Reddell Structure Shows Distillate

NEW ORLEANS, La.—The Reddell dome is regarded as a major South Louisiana oil field prospect as Continental Oil Co. and Humble Oil & Refining Co. prepare to test the 3 Pardee Lumber Co., in 20-4s-1w, and located 1¼ miles west of the Danciger et al wildcat which has already indicated commercial production. First test in the 3 Pardee was delayed when operators found a tight spot in the hole which stopped the gun perforator from going down to the proper level, and the hole had to be reamed. The Continental-Humble operation is bottomed at 11,589 ft., 6-in. casing set for testing and completion. It topped the Vicksburg at 7,650 ft., Jackson 8,315 ft., Cockfield 8,660 ft., found gas-distillate sands in both the Haas and Tate zones of the Sparta section. A major fault was cut, causing the well to run some 250 ft. high to the Danciger et al test. Wilcox sands showing gas and condensate were found at 10,620-76 ft., 10,870-900 ft. and 11,393-423 ft., with bottom sand showing condensate, topped at 11,446 ft.

St. James Parish.—Humble Oil & Refining Co. 1 V. Zeringue & Sons, 7-12s-16e, at St. James field, drilling at 10,875 ft. in sand and shale. Humble has one gas-condensate producer and one dry hole to its credit in this area and the current operation is being watched with considerable interest.



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ROCKY MOUNTAIN

Discovery Reported In Sunburst Sand Near Conrad

DENVER, Colo. — The search for a new oil pool in Pondera County Montana, 8 miles east of Conrad and approximately 30 miles southeast of the Cut Bank field, which has been in progress for the past 2 years, has been rewarded with a measure of success in Hageman & Pond 1 Rispin, SE SE NW 20-28n-1w, which found 15 ft. of saturated Sunburst sand at 1,750-65 ft., after going through 14 ft. of dry sand. The well pumped 74 bbl. of 44.1-gravity crude oil the first 24 hours and then settled gradually to 27 bbl. per day. A drilling campaign already getting under way will disclose the extent of the discovery, which gives some evidence of proving the sand productive over a considerable area.

Northeast Colorado test. — Northeastern Colorado, which has been quiescent during the present activities in other Rocky Mountain areas, is to have an 8,000-ft. test in Weld County at the Ohio Oil Co. 1 Nordloh, SE SE 20-5n-63w, which is going to attract wide attention. The location is 12 miles southeast of Greeley near the town of Kuner, 18 miles southwest of the Greasewood pool, and 35 miles southeast of the Amerada Petroleum Co.'s 8,000-ft. drilling test at Clark's Lake in Larimer County. The Ohio company is reported to have 50,000 acres blocked up on four or five highs in that district, and to be prepared to complete at least one test this year. The company was active in that district 10 years ago when the Greasewood pool was discovered, and since then has had a representative stationed at Greeley studying the area, and has had extensive surveys made, including a recent checking with the seismograph. The result is what is considered an entirely new geological picture of the district. Former wildcatting was along a line of folding extending eastward from Greasewood Flats. It is reported that studies have shown a line of folding running north and south parallel with the mountain range, and separated from the mountains by a deep syn-

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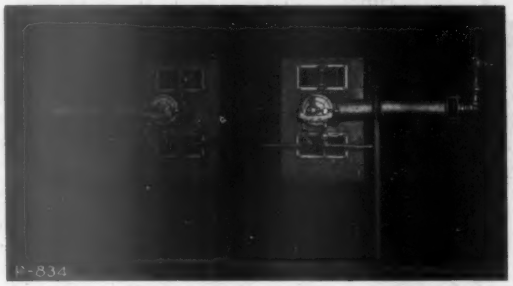

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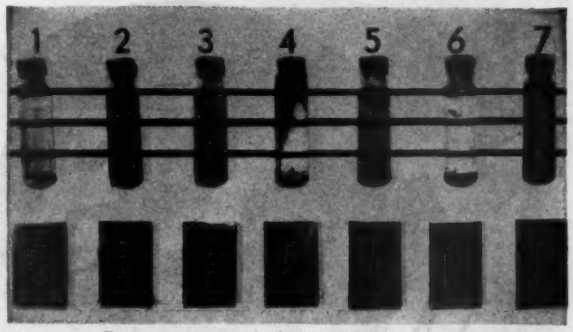
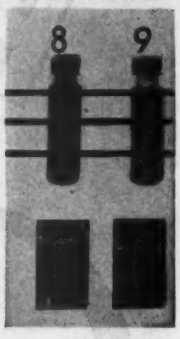


From an unretouched photograph.



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All strips were then partly immersed in small bottles of distilled water containing 3% Sodium Chloride. At the end of 90 hours they appeared as displayed above. Each test strip is shown before its bottle of solution. The rust penetration on each strip is plainly evident. The background lines behind the bottles enable comparison of rust density found in the solutions after test. The superiority of Anti-Corrode, number 6, is obvious.

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cline, upon which there are a series of prominent highs. The fold has been traced in some instances as far south as the Callhan district in El Paso County.

Pennsylvanian test for Iles. — The Iles field in Northwest Colorado, which has produced nearly 10,000,000 bbl. of oil from the Sundance horizon, the deepest formation so far drilled, is to have a deep test to the Pennsylvanian. It is reported that the Stanolind Oil & Gas Co., which is the principal producer in the field, will move in rotary rig from the Beaver Creek well is Routt County, which is being abandoned, and will drill on top of the structure at a location not yet released. The principal objective probably will be the equivalent of the Tensleep in Wyoming and the Weber at Rangely. There are no outcrops of the Pennsylvanian within 100 miles, and the probable depth is uncertain. Only one well is producing from the Pennsylvanian in western and northwestern Colorado, this being the California Co. 1 Raven at Rangely, which recently was put on production after having been shut in for 10 years. In anticipation of application for renewal of federal leases next year, the field is being unitized. Some of the original leases provided for a test of all producing horizons, but the requirement was waved during the period when the crude was not particularly needed. Based on measurements at Rangely, the top of the Pennsylvanian may be expected at around 5,000 ft. Outcome of test will influence prospects in deeper pays at Moffat, Wilson Creek and other fields in the district producing from the Morrison and Sundance.

COLORADO WILDCAT COMPLETIONS

Beaver Creek, Routt County: Stanolind Oil & Gas Co. 2 Milliken, NE SE SW 32-4n-89w, T.D. 4,454 ft., top of Sundance sand 4,216 ft., only slight show of oil, plugged and abandoned. Top Frontier 3,086 ft., top Dakota 3,523 ft.

WYOMING WILDCAT COMPLETIONS

Big Hollow, Albany County; Ricgar Oil Co. 1 Fuller, NW NE NE 7-15n-75w, plugged and abandoned at 895 ft., after testing Muddy sand.

MONTANA WILDCAT COMPLETIONS

Brady Block, Pondera County: Texas Co. 1 Schlepp, SE SE SE 21-27n-2w, T.D. 1,725 ft., top of Madison 1,719 ft., sulfur water, plugged back to Sunburst sand at 1,450-82 ft., shot with 30 qts. at 1,470-82 ft., pumped 25 bbls. first 24 hours.

East Shelby (Devon), Toole County: Northern Ordnance, Inc., 1 Prodger, C SE SE 29-32n-2e, T.D. 2,902 ft., top Sunburst 1,674 ft., show of oil, shot with 60 qts., acid. 500 gals., no increase, plugged and abandoned.

Midway, Pondera County: Hageman & Pond 1 Rispin, SE SE NW 20-28n-1e. T.D. 1,765 ft., Sunburst sand 1,736-65 ft., saturated at 1,750-65 ft., fluid level 1,100 ft. in 24 hours, 1,600 ft. in 4 days. pumped 74 bbl. first 24 hours, settled to 27 bbl. per day, 44.1 gravity.

South Shelby, Toole County: Napar Oil & Gas Co. 1 Nadeau, NW NW SE 11-31n-3w, gas sand (Sunburst) 1,235-41 ft., 500,000 cu. ft. gas.

N. CENTRAL TEXAS

New Ellenburger Production Found West of Hull-Silk

WICHITA FALLS, Tex.—J. A. McCarty and Coleman 1 W. H. Taylor, Lot 13, Block 17, A.T.N.C.L. Survey, 4 miles southwest of Holliday and west of Hull and Silk pool, flowed oil by heads while tubing was being run, and was still heading as storage was being erected. The pay was found from 4,937-70 ft., and total depth is 4,973 ft. Performance indicates a very good well, stimulating future drilling for Ellenburger production along the trend southwest of Hull-Silk pool.

Montague County.—Continental Oil 1 H. C. Gadberry, east extension to the Hildreth pool, which drilled through the conglomerate pay to the Simpson which it found dry and plugged back, was completed from Bend pay for 564 bbl. per day. Lion Oil Refining Co. 1 Freeman, 9,000-ft. wildcat south of Forestburg, was nearing contract depth while drilling below 8,585 ft. in dry dolomite.

In Clay County, Consolidated Oil Co. and L. T. Burns 1 Bryant Edwards, S. C. Beldon Survey, 5 miles east of Henrietta, had sand showing oil 5,105-30 ft., but was unable to get test on drill stem, and drilled ahead,

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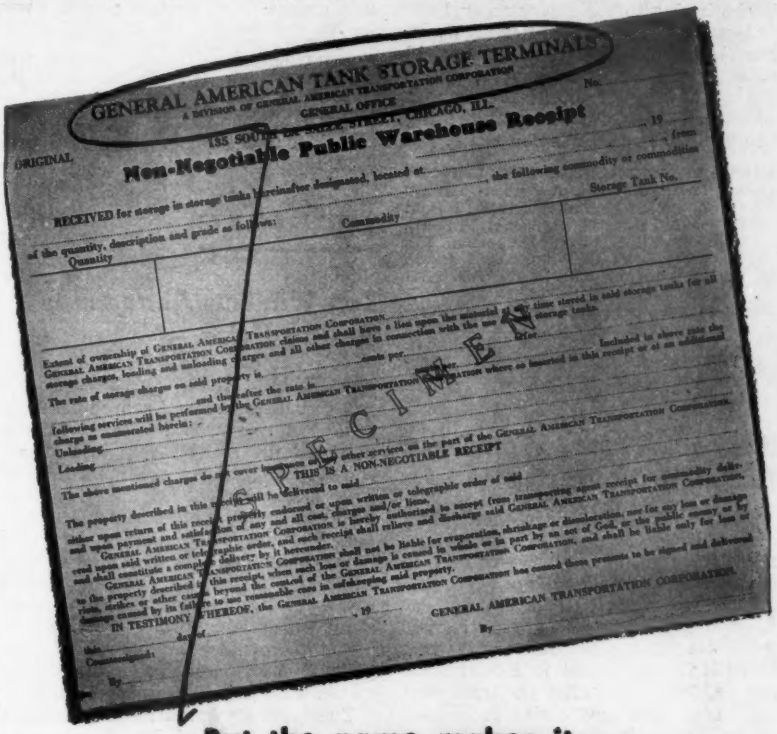
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topping Simpson at 6,002-42 ft., recovering 10 ft. drilling mud on drillstem test with no oil showing, and is continuing to the Ellenburger. Fail-

Jack County.—Shell Oil 1 W. T. Pursley, N. A. Slaughter Survey, 10 miles northwest of Jacksboro, had a slight showing of oil in the Bryson sand at 3,338-70 ft., and was drilling below 4,850 ft. in lime and shale.

NORTH TEXAS WILDCAT COMPLETIONS

Throckmorton County: Anderson-Prichard Oil et al 1 J. M. Batchler, 660 ft. from E, 695 ft. from S, Sec. 1691, T.E.&L. Sur., 13 mi. E of Throckmorton, I.P. 72 bbl. 40 gravity, 40 per cent water, Caddo lime pay 3,925-39 ft., T.D. 4,311 ft. Discovery.

Wichita County: W. A. Baber 2 H. G. Karrenbrock, 1,264 ft. from N, 200 ft. from W, John Albredge Sur., dry, T.D. 640 ft. C. G. Johnson 1 W. L. Scott, Sec. 15, Tarrant County School Land, dry, T.D. 605 ft.

Stephens County Well Flows 70 Bbl. an Hour

ABILENE, Tex.—Texas-Pacific Coal and Oil Co. 1 R. F. Grown, Section 113, 1¾ miles southwest of the same company's Mississippi lime production on the Hill lease, west of Eliasville, opened a new prolific spot from the Mississippi lime last week when it flowed 70 bbl. in 1 hour from pay 4,154-77 ft., after a treatment with acid. The new strike is located in an old area producing from the Caddo or Bend lime, and it is a twin to an old abandoned gas well drilled by California Petroleum Co. Five miles south of this new strike, Ledge Petroleum Co. 1 Black Bros. Ranch, SW SE Section 1138, T.E.&L. Survey, west offset to the J. D. Hancock 1 Black discovery, topped Caddo lime showing oil at 3,282 ft., drilled to 3,226 ft., and cemented 5½-in. casing to 3,226 ft. and was preparing to perforate.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Fisher County: Siosi Co. 1 C. C. Prater, 660 ft. from E, 1,980 ft. from S, Sec. 53, H.T.&B. Ry. Sur., 2 mi. SW of McCaulley, dry, T.D. 3,411 ft.

KANSAS

Offset to Discovery at Belpre Is Gas Well

EDWARDS County.—Cities Service Oil Co.'s west offset to the discovery well of the Belpre pool came in as a large gas well last week. The 1 Breitenbach, E½ SE SE 5-25-16w, blew in for an estimated 13,000,000 cu. ft. of gas a day after acidizing the Kansas City lime through perforations at 3,806-14 ft. Total depth was 4,480 ft. in Viola lime. The discovery well flowed and swabbed a total of 330 bbl. oil in the Lansing lime at 3,933-38 ft.

KANSAS WILDCAT COMPLETIONS

Leavenworth County: Roxan Oil Co. 1 Reiger, E½ NW NE 29-11-22e, 250,000 cu. ft. gas, sand 795-805 ft.

Rice County: C. L. Carlock 1 Bailey, NW NE 36-21-6w, dry, T.D. 3,541 ft., Lansing 2,896 ft., Mississippi lime 3,539 ft.

Russell County: Lion Oil Ref. 1 Stumpf, NW NE NE 33-14-11w, dry, T.D. 3,237 ft., Lansing 2,815 ft., Arbuckle 3,176 ft.

Stafford County: Dasa Oil Co. 1 Newell, SE NW NE 33-24-11w, dry, T.D. 4,112 ft., Lansing 3,463 ft., Viola 3,888 ft., Arbuckle 4,090 ft.

MICHIGAN

Ten Wildcats Abandoned As Dry Holes

SAGINAW, Mich.—Extent of Michigan oil operators' search for new crude sources was indicated in the completions report for last week showing 10 wildcat locations; lack of success was indicated by the fact that all were completed as dry holes, one only showing some promise and that being abandoned as a dry hole after acidizing failed to develop oil in a worth-while amount. The tests were drilled in nine counties.

A total of 16 completions was reported, four rating as commercial wells, with one in Osceola County.

The state Conservation Department reported a total of 560,000 acres of state-owned land now under lease to oil and gas operators as the result of the leasing last week of 20,813 acres additional at a bonus price of $18,807. Highest prices were paid for leases in Moffatt and Adams townships, Arenac County, and in Pinora Township, Lake County.

Also indicative of the need for new reserves was the record granting of 28 drilling permits in the past week. The locations, in 10 counties, boosted the permit total for the year to 473. Seven permits are for Van Buren County, five for Osceola, three for Allegan, three for Newaygo, two for Lake, Clare, Arenac and Gladwin, one each in Roscommon and Bay.

MICHIGAN WILDCAT COMPLETIONS

Allegan County, Allegan Township: Miller Bros. 1 F. S. Vahue, NE NE SE 8-2n-13w, acidized for show of oil in Traverse limestone, comp. dry, T.D. 1,605 ft.

Bay County, Frankenlust Township: Michigan Producers & Refiners, Inc. 1 Trautner, C S½ SW SW 7-13n-4e, dry in Monroe, T.D. 3,630 ft.

Clare County: Surrey Township: Union Drilling & Producing Co. 1 Meryl H. Davison, C N½ NE NE 20-17n-5w, dry in Dundee, T.D. 4,205 ft.

Kent County, Caledonia Township: Carl Grimes-Del Fortney 1 Harry Herrick, SW SW SW 9-5n-10w, dry in Traverse limestone, T.D. 2,027 ft.

Lapeer County, Burnside Township: Clarence Wilcox 1 John Haslick, NE NW NE 30-9n-12e, dry in Monroe, T.D. 2,660 ft.

Mecosta County, Grant Township: Gordon Oil Co. 1 Michigan Trust, C W½ SE SW 36-16n-9w, dry in Monroe, T.D. 3,840 ft.

Muskegon County, Sullivan Township: Robert L. Sanders 1 Sullivan Township land, SE SE SE 10-9n-15w, dry in Monroe, T.D. 2,355 ft.

Osceola County, Hartwick Township: Gordon Oil Co. A-1 State-Hartwick, E½ SW SE 31-19n-8w, dry hole, T.D. 1,798 ft.

LeRoy Township: Rose & Bolger 1 August Carlson, C S½ SW SE 26-19n-10w, dry in Monroe, T.D. 3,931 ft.

Van Buren County, Bangor Township: Socony-Vacuum Oil Co., Inc. 1 J. and R. Yieder, SW SW SW 2-2s-16w, dry in Traverse limestone, T.D. 1,036 ft.

CANADIAN FIELDS

Fort Norman Area Shows Good Potentialities

CHATHAM Ont. — Unofficial estimates report the potential crude production of the Fort Norman field at between 3,500 and 5,000 bbl. a day, which will be delivered as soon as pipe-line and storage facilities are available. In the first 6 months of 1943 supplying petroleum products which were refined at the Imperial Oil plant at Norman Wells for the northern trade and the Alaska Highway, the field produced 89,929 bbl. with about three wells in fairly steady production and the remainder flush production from new completions till they were shut in. Some 24 wells have been completed and capped, pending completion of the 600-mile pipe line to Whitehorse, Y. T. Dr. T. A. Link, whose first connection with the field dates from the Imperial development in 1919 and who is now chief geologist for the U. S. Government in connection with the Canol project, states that the field has much greater potentialities than were first anticipated and that more intensive development is certain, in view of the possibility of a petroleum shortage.

The Imperial discovery well, completed in 1920, is still flowing. In drilling, skid rigs or portable derricks are used, mostly manned by crews from Turner Valley. Drilling is comparatively shallow, the producing horizon in the Devonian limestone being 1,200 and 2,100 ft. The oil is free from sulfur and has a paraffin base, with very little wax.

The pipe line is expected to be in operation this fall, and will deliver crude to a refinery at Whitehorse. The plant being assembled there was formerly at Corpus Christi, Tex., and will produce aviation gasoline. Branch lines will carry the refinery output to Watson Lake, Y. T., and Fairbanks, Alaska. There is some uncertainty as to the operation of the pipe lines under Arctic weather conditions. The Norman crude has a pour point of 70° below zero, though trouble may develop at higher subzero temperatures. B. W. Lambright, formerly in the Ploesti fields of Rumania, is project manager at Norman Wells, and W. L. Taylor is superintendent for Imperial Oil.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, General Land Office, District Land Office, Cheyenne, Wyoming. Notice is hereby given that the land herein described within the known geologic structure of the East Lance Creek oil and gas field, Wyoming, is offered to the qualified bidder of the highest amounts offered per acre as a bonus for the privilege of leasing the land under section 17 of the leasing act as amended by the act of August 21, 1935 (49 Stat. 674, 30 U.S.C. 226), at a sale to be held in the District Land Office at Cheyenne, Wyoming, at 10 a.m. on November 4, 1943, as a single parcel: T. 36 n., R. 64 W., sec. 28, S½NW¼. The lease will be made subject to the unit plan for the East Lance Creek Unit Area, Wyoming, approved March 2, 1938. The successful bidder must deposit on date of sale with the officer in charge of the sale a certified check or cash for one-fifth of the amount bid by him and file a showing of qualifications to receive a lease as required by section 7 of Circular 1386. The remainder of the bonus bid and annual rental at the rate of $1 per acre must be paid and a $5,000 corporate surety bond must be furnished prior to the issuance of the lease. Bids may also be submitted by mail provided they are accompanied by one-fifth of the bonus bid and a showing of qualifications of the bidder. The envelope must be plainly marked for opening on the day and hour of the sale. Bidders are warned against violation of section 59, United States Criminal Code, approved March 4, 1909, prohibiting unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. William G. Johnson, Register.

LEGAL

LEASE OF OIL AND GAS PRIVILEGES ON STATE REFORESTATION AREA LANDS, STEUBEN COUNTY, N. Y.

Sealed bids for the leasing of the State's interest in the right to prospect, extract, pipe, store and remove oil and natural gas from State reforestation area lands in Steuben County, more particularly described as Steuben Reforestation Area #12, Proposals A. and C., located in Lots 82, 87 and 106, Township 2, Range 6, Phelps and Gorham Purchase, consisting of 295.45 acres, will be received at the office of the Conservation Commissioner, 488 Broadway, Albany, N. Y., until 2:30 EWT on October 20, 1943.

Bids must be submitted in sealed envelopes endorsed on the outside with the name of the bidder and the following: "Proposal for gas and oil privileges on State lands in Steuben County, N. Y., to be opened at 2:30 P.M., EWT, October 20, 1943."

These privileges will be leased to the highest bidder in accordance with the terms of Section 60b of the Conservation Law and of the standard oil and gas lease of the State of New York, which in this instance may be modified prior to execution as may be mutually agreeable, to provide for participation by the State in a unit operation applying to these and other lands within the area of the same subsurface feature as may be determined by the State Geologist. Copies of this lease will be furnished to prospective bidders upon application. Official maps of the Conservation Department showing location of the lands to be leased may be seen at the office of the Conservation Department, Albany, and at the office of District Forester I. S. Bowlby, 34 Liberty Street Bath, N. Y.

Bidding for these privileges will be upon the royalty per thousand feet for gas, in addition to which an annual rental of $300 will be required and also one-eighth of the market value of any oil produced. Bids must be accompanied by a certified check or cash deposit in the amount of the annual rental, which will be credited to the successful bidder upon execution of the lease. Deposits of unsuccessful bidders will be returned. Successful bidders will be required to give a bond of $5,000 for faithful performance of the terms of the contract. The Conservation Department reserves the right to reject any and all bids. JOHN A. WHITE, Commissioner.

LEGAL

OIL AND GAS LEASE—UNITED STATES DEPARTMENT OF AGRICULTURE, Soil Conservation Service, Milwaukee, Wisconsin, October 1, 1943. Sealed bids in triplicate will be received until 2:30 p.m., CWT, November 5, 1943, and then publicly opened, offering bonus for operating rights in connection with gas and oil leases on land in the Crab Orchard Project located at Williamson County, Illinois.

T. 9S., R. 1 E., Sec. 28, NW¼, E½ SW¼; Sec. 29, NW¼, NW¼ SW¼, E½ NE¼, NW¼ NE¼, W½ SW¼ NE¼; Sec. 30, N½, N½ SE¼; Sec. 31, W-¾ NE¼; Sec. 33, SW¼ NW¼, E½ W½.

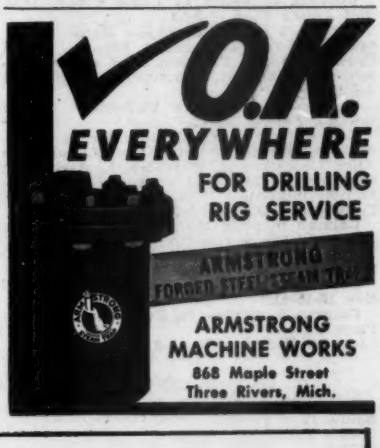
T. 10S., R. 1. E., Sec. 4, N½, W½ of SE¼ lying north and west of Grassy Lake; N 70 acres of E½ of SE¼, SW¼; Sec. 5, N-¾, SE¼ SW¼, S½ SE¼, except two acres in the form of a square in the southwest corner; containing approximately 2,506 acres.

Award of lease will be made only to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms, and operating regulations from James Scammahorn, Chief, Regional Administrative Services Division, Soil Conservation Service, 809 North Broadway, Milwaukee 2, Wisconsin.

LEGAL

OIL AND GAS LEASE

U. S. DEPARTMENT OF AGRICULTURE, Farm Security Administration, Dallas, Texas: Sealed bids, in triplicate, will be received until 2 o'clock p.m., (cwt) Friday, October 22, 1943, and then publicly opened, offering bonus for operating rights in connection with oil and gas leases on lands in the Texas Farm Tenant Security Project, consisting of 214.453 acres, located approximately 6 miles southeast from the town of Pilot Point, Denton, County, Texas, and being a part of the Isaac Walters Survey. Award of lease will be made to bidder who can show sufficient experience and financial resources and prove citizenship. Interested parties may obtain bid documents, lease forms and operating regulations from the office of the Regional Business Manager, Farm Security Administration, Parry Avenue at Commerce, Dallas, Texas.



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CRUDE PRICES

OKLAHOMA AND KANSAS GRAVITY TABLES

	1	2	3	4	5	6
Below 21	....	....	....	$.85	$.85	....
21-21.9	....	....	....	.87	.87	....
22-22.9	....	....	....	.89	.89	....
23-23.9	....	....	....	.91	.91	....
24-24.9	....	....	....	.93	.93	....
Below 25	$.92	....	....	....	....	....
25-25.9	.95	$.95	....	.95	.95	....
26-26.9	.97	.97	....	.97	.97	....
27-27.9	.99	.99	....	.99	.99	....
28-28.9	1.01	1.01	$1.01	1.01	1.01	....
29-29.9	1.03	1.03	1.03	1.03	1.03	....
30-30.9	1.05	1.05	1.05	1.05	1.05	$1.05
31-31.9	1.07	1.07	1.07	1.07	1.07	1.07
32-32.9	1.09	1.09	1.09	1.09	1.09	1.09
33-33.9	1.11	1.11	1.11	1.11	1.11	1.11
34-34.9	1.13	1.13	1.13	1.13	1.13	1.13
35-35.9	1.15	1.15	1.15	1.15	1.15	1.15
36-36.9	1.17	1.17	1.17	1.17	1.17	1.17
37-37.9	1.19	1.19	1.19	1.19	1.19	1.19
38-38.9	1.21	1.21	1.21	1.21	1.21	1.21
39-39.9	1.23	1.23	1.23	1.23	1.23	1.23
40 and above	1.25	1.25	1.25	1.25	1.25	1.25

OKLAHOMA FLAT PRICE

Cumberland	$1.14

Pure Oil Co., 9-4-41.

OKLAHOMA AND KANSAS TABLE EXPLANATION

Column 1 Mid-Continent grades:
Pure Oil Co., 5-20-41.
Gulf Oil Corp., 5-20-41.
Skelly Oil Co. (Kansas only), 5-19-41.
H. F. Wilcox Oil & Gas Co., 5-20-41.
Gulf, in Jackson and Tillman counties, Oklahoma, effective 9-11-43.

Column 2 Mid-Continent grades:
White Eagle Oil Purchasing Co., Inc., 5-19-41, Kansas only.
Sinclair Prairie Oil Marketing Co., 5-20-41.

Column 3 Mid-Continent grades:
Continental Oil Co., 5-19-41.
Phillips Petroleum Co., 5-19-41.
Tide Water Associated Oil Co., 5-20-41.

Column 4 Mid-Continent grades:
Standard Oil Co. (Indiana), 5-20-41
National Refining Co., 5-20-41.
Carter Oil Co.

Column 5 Mid-Continent grades:
Magnolia Petroleum Co., 10-1-43.
Shell Oil Co., Inc., 10-1-43.
Ben Franklin Refining Co., 9-7-43.

Column 6 Oklahoma:
Champlin Refining Co., 5-20-41.

LOUISIANA AND SOUTHERN ARKANSAS TABLE EXPLANATION

Standard Oil Co. of Louisiana, 5-22-41.

Column 1 applies to Atlanta, Buckner, Magnolia, Schuler (Jones sand), Village, and Lewisville fields.

Column 2 applies to De Soto, Sabine, Fouke, Homer, Miller County, Sugar Creek, and Nebo.

Column 3 applies to Little Creek, Olla, and South Olla (4-3-43).

Column 4 applies to Bayou Mallet, Choctaw, Darrow, Jeanerette, Lirette, North Crowley, South Crowley, Port Barre, Potash, Roanoke, St. Martinville, and Port Allen.

Column 5 applies to University (Baton Rouge). Posted 6-2-42.

Column 6 applies to Cotton Valley crude, Rodessa and Shreveport (Cross Lake); also Anse La Butte, effective 8-1-41, starting at 80 cents for below 21°, also to Caddo effective 10-15-41.

Continental Oil Co., 5-21-41.

Column 7 applies to Abbeville, Louisiana.

Stanolind Oil & Gas Co., 5-21-41.

Column 8 applies to East and West Hackberry.

Column 6 applies to Caddo Parish, effective 10-15-41.

Column 9 applies to Evangeline, Acadia Parish.

Lion Oil Refining Co., 5-22.41.

Column 1 applies to Reynolds lime, Jones sand, Schuler, Ark.

Column 2 applies to El Dorado, West and South Rainbow fields, Snow Hill, and Schuler-Morgan sand.

Placid Oil Co., 5-22-41.

Column 3 applies to Olla.

Column 2 applies to Nebo field.

Shell Oil Co., Inc., 5-20-41.

Column 10 applies to Roanoke, Chalkley

Column 11 applies to Iowa, Black Bayou.

White Castle.

Column 12 applies to Gibson, South Houma, Hester, West Lake Verret.

Magnolia Petroleum Co., 5-21-41.

Column 13 applies to Lockport, Cameron Meadows, and West Gueydan, La.

Column 6 applies to Haynesville, Cotton Valley, Rodessa, La., and Miller County, Arkansas.

Phillips Petroleum Co., 3-29-41.

Arkansas Fuel Oil Co., 2-19-42.

Column 1, Schuler (Jones sand), except schedule starts at 76 cents for below 25° gravity.

Gulf Refining Co., 5-21-41.

Column 9, Jennings.

Column 6, Edgerly, Starks, Vinton, East Hackberry, Cameron Meadows, and Leesville.

Column 16 applies to Grand Bay, Quarantine Bay, Timbalier Bay, and West Bay, except schedule starts at $1.12 for below 28° gravity.

Column 6 applies to Caddo, Homer, Bull Bayou, Crichton, De Soto, Haynesville, and El Dorado.

Column 4 applies to West Gueydan, effective 5-25-42.

Pure Oil Co., 4-22-41.

Column 14 applies to Gueydan crude.

Column 6, Caddo, Homer, Haynesville, Bull Bayou, Crichton, De Soto, and El Dorado.

Texas Co., 5-21-41.

Column 6 applies to North Louisiana.

Columns 15 and **16,** Bay St. Elaine, Caillou Island, Iberia, Lake Barre, Lake Pelto, Leesville, Port Barre. (Schedules A and B).

Column 17, Bateman Lake, Dog Lake, Fausse Point, Horseshoe Bayou, Jefferson Island, Plumb Bob, Vermilion Bay, West Cote Blanche, and Delta Duck Club.

Column 18, Delta Farm, Lake Salvador, Golden Meadow.

Allied Pipe Line Corp.

Column 2 applies to Pickens, Mississippi, 9-8-43.

LOUISIANA AND ARKANSAS FLAT PRICES

Continental Oil Co.:	
Tepetate and Lake Arthur, 5-21-41	$1.18
Ville Platte, 5-22-43	1.30
Bear, 5-15-43	1.30
Gulf Refining Co., 5-21-41:	
Smackover (Ark.)	$0.83
Lion Refining Co., 5-22-41:	
Smackover (heavy)	$0.83
Dorcheat	1.15
Phillips Petroleum Co., 5-22-41:	
Smackover (heavy)	$0.83
Placid Oil Co., 5-22-41:	
Tullos-Urania (5-21-41)	$1.15
Cotton Valley dist. (above 60°)	1.30
Cotton Valley (Holloway sand)	1.25
Cotton Valley (Bodcaw-D sands)	1.20
Pure Oil Co.:	
Bosco (5-21-41)	$1.14
Sweet Lake (5-22-41)	1.06
Creole (5-22-41)	1.16
Republic Oil Co., 6-2-41:	
Nevada County, Arkansas	$0.80
Republic Oil Refining Co., 5-21-41:	
Bayou Pigeon	$1.20
Shell Oil Co., Inc., 5-20-41:	
Happytown	$1.15
Standard Oil Co. of Louisiana, 5-22-41:	
Big Creek, Dorcheat, McKamie, Columbia, Macedonia (sour) (2-3-43)	$1.25
Smackover (heavy)	0.83
Cotton Valley distillate (9-1-41)	1.40
Cotton Valley (Holloway sand)	1.25
Lisbon distillate	$1.30
Texas Co., 5-21-41:	
Erath	$1.21
Garden Island	1.36
Lafitte, Paradis	1.19
Lake Mongoulois	1.36

MIDDLE WEST FLAT PRICES
Illinois and Indiana

Ohio Oil Co.:	
Illinois basin, 5-21-41	$1.37
Eastern Illinois, 5-21-41	$1.33
Western Indiana, 5-21-41	1.33
Magnolia Petroleum Co.:	
Illinois basin, 5-21-41	$1.37
Carter Oil Co.:	
Illinois (Louden), 5-21-41	$1.37
Sohio Corp.:	
Illinois basin, 5-21-41	$1.37

LOUISIANA, MISSISSIPPI AND SOUTHERN ARKANSAS GRAVITY TABLE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Below 18	....	....	....	....	....	....	....	....	....	....	....	....	$.94	....	....	....	....	....
18-18.9	....	....	....	....	....	....	....	....	....	....	....	....	.96	....	....	....	....	....
19-19.9	....	....	....	....	....	....	....	....	....	....	....	....	.98	....	....	....	....	....
Below 20	....	....	....	....	....	....	....	$1.06	....	$.94	$.99	$.89	....	....	$1.06	....	....	....
20-20.9	....	....	....	....	....	....	....	1.08	....	.96	1.01	.91	1.00	....	1.08	....	....	....
Below 21	$.68	....	....	$.90	....	....	....	....	....	....	....	....	....	$.90	....	....	....	....
21-21.9	.70	....	....	.92	....	....	....	1.10	....	.98	1.03	.93	1.02	.92	1.10	....	....	....
22-22.9	.72	....	....	.94	....	....	....	1.12	....	1.00	1.05	.95	1.05	.94	1.12	....	....	....
23-23.9	.74	....	....	.97	....	....	....	1.14	....	1.02	1.07	.97	1.08	.96	1.14	....	....	....
24-24.9	.76	....	....	.98	....	....	....	1.16	....	1.04	1.09	.99	1.11	.98	1.16	....	....	....
Below 25	....	$.86	$1.03	....	....	$.88	....	....	....	....	....	....	....	....	....	....	....	....
25-25.9	.78	.88	1.05	1.00	....	.90	....	1.18	....	1.06	1.11	1.01	1.14	1.00	1.18	....	....	....
26-26.9	.80	.90	1.07	1.02	....	.92	....	1.20	....	1.08	1.13	1.03	1.17	1.02	1.20	....	....	....
27-27.9	.82	.92	1.09	1.04	....	.94	....	1.22	....	1.10	1.15	1.05	1.19	1.04	1.22	....	....	....
28-28.9	.84	.94	1.11	1.06	....	.96	....	1.24	....	1.12	1.17	1.07	1.21	1.06	....	$1.14	$1.06	....
29-29.9	.86	.96	1.13	1.08	....	.98	....	1.26	....	1.14	1.19	1.09	1.23	1.08	....	1.16	1.08	....
30-30.9	.88	.98	1.15	1.10	$1.20	1.00	....	1.28	....	1.16	1.21	1.11	1.25	1.10	....	1.18	1.10	$1.05
31-31.9	.90	1.00	1.17	1.12	1.30	1.02	....	1.30	$1.07	1.18	1.23	1.13	1.27	1.12	....	1.20	1.12	1.07
32-32.9	.92	1.02	1.19	1.14	1.32	1.04	....	1.32	1.09	1.20	1.25	1.15	1.29	1.14	....	1.22	1.14	1.09
33-33.9	.94	1.04	1.21	1.16	1.34	1.06	....	1.34	1.11	1.22	1.27	1.17	1.31	1.16	....	1.24	1.16	1.11
34-34.9	.96	1.06	1.23	1.18	1.36	1.08	....	1.36	1.13	1.24	1.29	1.19	1.33	1.18	....	1.26	1.18	1.13
35-35.9	.98	1.08	1.25	1.20	1.38	1.10	....	....	1.15	....	....	....	....	1.20	....	1.28	1.20	1.15
Below 36	....	....	....	....	....	....	$1.07	....	....	....	....	....	....	....	....	....	....	....
36-36.9	1.00	1.10	1.27	1.22	1.40	1.12	1.09	....	1.17	....	....	....	....	1.22	....	1.30	1.22	1.17
37-37.9	1.02	1.12	1.29	1.24	1.42	1.14	1.11	....	1.19	....	....	....	....	....	....	....	....	1.19
38-38.9	1.04	1.14	1.31	1.26	1.44	1.16	1.13	....	1.21	....	....	....	....	....	....	....	....	1.21
39-39.9	1.06	1.16	1.33	1.28	1.46	1.18	1.15	....	1.23	....	....	....	....	....	....	....	....	1.23
40 and above	1.08	1.18	1.35	1.30	1.48	1.20	1.17	....	1.25	....	....	....	....	....	....	....	....	1.25

Kellogg's completely integrated service to petroleum refiners embraces all functions of the engineer-contractor, from the inception of process in the research laboratory to the initial operation of the completed plant.

Only by concentrating these varied functions in one organization can the refiner assure himself of unified responsibility for the success of his plant.

DESIGN, CONSTRUCTION and LICENSING

CATALYTIC PROCESSES for Cracking, Hydroforming, Reforming, Dehydrogenation, Alkylation, Desulphurization
GASOLINE PRODUCTS COMPANY, INC....Pyrolytic Cracking • THE POLYMERIZATION PROCESS CORPORATION...Thermal and Catalytic Polymerization
JUIK Processes . . . for Lubricating Oil Refining with Propane and Phenol • Deasphalting • Dewaxing • Solvent Extraction and Acid Treating Plants

Texas Co.:
Illinois basin, 5-21-41 ..... $1.37
Gulf Refining Co.:
Illinois basin, 5-21-41 ..... $1.37

Michigan

Simrall Corp., 5-27-41:
Greendale, Porter, Vernon, Crystal, and Wise $1.44
Buckeye, Bentley, Edenville, Beaverton, and Monitor (sweet) 1.43
Freeman, Redding, Lincoln and Winterfield 1.39
Hamilton-Grout 1.39
West Branch-Arenac 1.34
Sohio Corp., 5-1-41:
Bloomingdale-Columbia $1.45
Mid-West Refineries, Inc., 5-1-41:
Kent County $1.38
Pure Oil Co., 5-27-41:
Sherman $1.39
Midland (Midland County) 1.44

SOUTH TEXAS AND SOUTHWEST TEXAS GRAVITY TABLES

	1	2	3	4	5	6	7
Below 20	$1.03	$1.08	$1.08	$.89	$1.03	$1.03	$1.08
20-20.9	1.05	1.10	1.10	.90	1.05	1.05	1.10
21-21.9	1.07	1.12	1.12	.91	1.07	1.07	1.12
22-22.9	1.09	1.14	1.14	.92	1.09	1.09	1.14
23-23.9	1.11	1.16	1.16	.93	1.11	1.11	1.16
24-24.9	1.13	1.18	1.18	.94	1.13	1.13	1.18
25-25.9	1.15	1.20	1.20	.95	1.15	1.15	1.20
26-26.9	1.17	1.22	1.22	.96	1.17	1.17	1.22
27-27.9	1.19	1.24	1.24	.97	....	1.19	1.24
28-28.9	1.21	1.26	1.26	.98	....	1.21	1.26
29-29.9	1.23	1.28	....	.99	....	....	1.28
30-30.9	1.25	1.30	....	1.00	....	....	1.30
31-31.9	1.27	1.32	....	1.01	....	....	1.32
32-32.9	1.29	1.34	....	1.02	....	....	1.34
33-33.9	1.31	1.36	....	1.03	....	....	1.36
34-34.9	1.33	1.38	....	1.04	....	....	1.38
35-35.9	1.35	1.40	....	1.05	....	....	1.40
36-36.9	1.37	1.42	....	1.06	....	....	....
37-37.9	1.39	1.44	....	1.07	....	....	....
38-38.9	1.41	1.46	....	1.08	....	....	....
39-39.9	1.43	1.48	....	1.09	....	....	....
40 and above	1.45	1.50	....	1.10	....	....	....

SOUTH TEXAS AND SOUTHWEST TEXAS TABLE EXPLANATION

Column 1 Mirando:
Humble Oil & Refining Co., 5-21-41, includes Blanchard, Bridwell, Colorado, Comitas, Eagle Hill, Escobas, Fitzsimmons, Glen, Government Wells (North and South), Heyser, Hoffman, Kelsey, Kohler, Loma Novia, Lundell, Manila, Mirando Valley, Placedo, Randado, Sarnosa, and Tesoro.
Magnolia Petroleum Co., 5-21-41.
Continental Oil Co., 7-1-41, includes Hoffman, Government Wells (North and South), Lopez, Moco, Colmena, Seven Sisters, South Seven Sisters, Loma Novia, Conoco, Driscoll, O'Hern, Piedra Lumbre, and Taranchauas.
American Mineral Spirits Co., 5-21-41, includes Adami and Munson.
Republic Oil Refining Co., 5-21-41, includes Heyser field crude.

Column 2 Refugio:
Continental Oil Co., 7-1-41, includes Minnie Bock, Clara Driscoll, South Clara Driscoll, Driscoll Ranch, Orange Grove and Wade City.
Humble Oil & Refining Co., 5-21-41, includes East White Point, Greta, Melon Creek, O'Connor-McFaddin, Plymouth Saxet, Taft, and Tom O'Connor.
American Mineral Spirits Co., 5-21-41, includes Plymouth, Taft, and East White Point.

Column 3 Refugio:
Texas Co., 5-21-41, includes Greta, Saxet, and Taft.

Column 4 La Rosa:
American Mineral Spirits Co., 2-29-41.

Column 5 Duval-Mirando:
Sun Oil Co., 5-21-41.

Column 6 Duval-Mirando:
Texas Co., 5-21-41.

Column 7 Nueces County:
American Mineral Spirits Co., 5-21-41.
Republic Oil Refining Co., 5-21-41.

NORTH TEXAS, WEST CENTRAL TEXAS, EAST CENTRAL TEXAS GRAVITY TABLES

	1	2	3	4	5	6	7	8	9
Below 20	....	....	....	....	$0.80	....	....	....	$0.80
20-20.9	....	....	....	....	.82	....	....	....	.82
Below 21	....	....	....	....	....	$0.85	....	....	....
21-21.9	....	....	....	....	.84	.87	....	....	.84
22-22.9	....	....	....	....	.86	.89	....	....	.86
23-23.9	....	....	....	....	.88	.91	....	....	.88
24-24.9	....	....	....	....	.90	.93	....	....	.90
Below 25	....	....	$0.88	....	....	....	$0.89	$0.95	....
25-25.9	$0.95	....	.90	$0.97	.92	.95	.91	.97	.92
26-26.9	.97	....	.92	.99	....	.97	.93	.99	.92
27-27.9	.99	....	.94	1.01	....	.99	.95	1.01	.92
28-28.9	1.01	$1.01	.96	1.03	....	1.01	.97	1.03	.92
29-29.9	1.03	1.03	.98	1.05	....	1.03	.99	1.05	.92
30-30.9	1.05	1.05	1.00	1.07	....	1.05	1.01	1.07	.92
31-31.9	1.07	1.07	1.02	1.09	....	1.07	1.03	1.09	.92
32-32.9	1.09	1.09	1.04	1.11	....	1.09	1.05	1.11	.92
33-33.9	1.11	1.11	1.06	1.13	....	1.11	1.07	1.13	.92
34-34.9	1.13	1.13	1.08	1.15	....	1.13	1.09	1.15	.92
35-35.9	1.15	1.15	1.10	1.17	....	1.15	1.11	1.17	.92
36-36.9	1.17	1.17	1.12	1.19	....	1.17	1.13	1.19	.92
37-37.9	1.19	1.19	1.14	1.21	....	1.19	1.15	1.21	.92
38-38.9	1.21	1.21	1.16	1.23	....	1.21	1.17	1.23	.92
39-39.9	1.23	1.23	1.18	1.25	....	1.23	1.19	1.25	.92
40 and above	1.25	1.25	1.20	1.27	....	1.25	1.21	1.27	.92

NORTH TEXAS, WEST CENTRAL TEXAS, EAST CENTRAL TEXAS TABLE EXPLANATION

Column 1 West Central and North:
Humble Oil & Refining Co., 5-22-43, includes Brown, Callahan, Comanche, Eastland, Fisher, Haskell, Jones, Shackelford, Stephens, and Throckmorton counties.
Panhandle Refining Co., 5-22-43, in Leuders area.
Gulf Refining Co., 5-22-43.
Sinclair Prairie Oil Marketing Co., 5-22-43.

Column 2 North Texas:
Continental Oil Co., 5-22-43.
Magnolia Petroleum Co., 5-22-43.
Panhandle Refining Co., 5-22-43.
Bell Oil & Gas Co., 5-22-43.
Texas Co., 5-22-43.

Column 3 East Central:
Magnolia Petroleum Co., 5-21-41, includes Cass, Panola, and Rodessa (Texas and Louisiana), and Miller County, Arkansas.
Gulf Refining Co., 5-21-41, includes Rodessa, Texas.

Column 4 East Central:
Humble Oil & Refining Co., 5-21-41, includes Anderson, Cherokee, Limestone, and Navarro counties and the Navarro Crossing field.

Column 5 East Central:
Humble Oil & Refining Co., 5-21-41, includes Hawkins field.

Column 6 North Texas:
Stanolind Oil Purchasing Co., 5-22-43.

Column 7 Fisher County:
Shell Oil Co., Inc., 12-11-41.

Column 8 Mexia:
Sinclair Prairie Oil Marketing Co., 5-30-41.

Column 9 Talco:
Magnolia Petroleum Co., 5-26-43.
Humble Oil & Refining Co., 5-26-43.

TEXAS GULF COAST GRAVITY TABLES

	(1)	(2)	(3)	(4)	(5)
Below 20	$1.06	$1.06	....	$0.98	$0.93
20-20.9	1.08	1.08	....	1.00	.95
Below 21	....	....	$1.08	....	....
21-21.9	1.10	1.10	1.10	1.02	.97
22-22.9	1.12	1.12	1.12	1.04	.99
23-23.9	1.14	1.14	1.14	1.06	1.01
24-24.9	1.16	1.16	1.16	1.08	1.03
25-25.9	1.18	1.18	1.18	1.10	1.05
26-26.9	1.20	1.20	1.20	1.12	1.07
27-27.9	1.22	1.22	1.22	1.14	1.09
28-28.9	1.24	1.24	1.24	1.16	1.11
29-29.9	1.26	1.26	1.26	1.18	1.13
30-30.9	1.28	1.28	1.28	1.20	1.15
31-31.9	1.30	1.30	1.30	1.22	1.17
32-32.9	1.32	1.32	1.32	1.24	1.19
33-33.9	1.34	1.34	1.34	1.26	1.21
34-34.9	1.36	1.36	1.36	1.28	1.23
35-35.9	1.38	....	1.38	1.30	1.25
36-36.9	1.40	....	1.40	1.32	1.27
37-37.9	1.42	....	1.42	1.34	1.29
38-38.9	1.44	....	1.44	1.36	1.31
39-39.9	1.46	....	1.46	1.38	1.33
40 and above	1.48	....	1.48	1.40	1.35

TEXAS GULF COAST GRAVITY TABLE EXPLANATION

Column 1:
Humble Oil & Refining Co., 5-21-41, includes Amelia, Clear Lake, Goose Creek, Hastings, Magnet, Mykawa (new), Raccoon Bend, South Thompson, Sugarland, Thompsen, and Webster fields.
Stanolind Oil & Gas Co., 5-21-41, includes West Beaumont, High Island, and Spindletop.
Sinclair Prairie Oil Marketing Co., 5-21-41.
Stanolind Oil Purchasing Co., 4-9-42, includes Clinton and Lake Creek.
Pure Oil Co., 4-21-41, includes Louise and Ganado.
Gulf Refining Co., 5-21-41, includes Spindletop, Sour Lake, Lovells Lake, West Beaumont, Goose Creek, South Liberty, Big Creek, Blue Ridge, Fannett, Moore, Barbers Hill, Hankamer, Thompson, Lochridge, Dyersdale, and Hull (old).
Sun Oil Co., 5-21-41, includes Barbers Hill, Batson (old), Bayou Blue, Chacahoula, Cotton Lake, Esperson (below 35° gravity), Fausse Point, Goose Creek, Greens Lake, Hackberry (east and west), Hull (below 35°), Humble (below 35°), Nome, North Dayton (below 25°), Orange, Saratoga, Sour Lake, South Liberty, and Vinton.

Column 2:
Texas Co., 5-21-41, includes Arriola, Ganado, Hamman, Hillje, Humble, Kubela, Magnet, Manvel, Markham, Mauritz, Old Ocean, Pickett Ridge, Port Neches, Sour Lake, West Columbia, and Withers.

Column 3:
Pan American Production Co., 5-21-41, includes Hastings and South Houston.
Stanolind Oil & Gas Co., 4-1-41, includes High Island, Spindletop, Hastings, and South Houston.

Column 4:
Humble Oil & Refining Co., 5-21-41, includes Anahuac, Angleton, Cedar Point, Fishers' Reef, Hull (new and old), Pierce Junction, Red Fish Reef, and Turtle Bay.
Gulf Refining Co., 5-21-41, includes Anahuac, Hull (new), Thompson (deep), Pierce Junction, and Orange.
Sun Oil Co., 5-21-41, includes Anahuac, Caplen and Turtle Bay.
Humble Oil & Refining Co., 2-29-41, includes Dickinson, Gillock, Hardin, League City, and Rowan.
Pure Oil Co., 2-23-43, at Alief field.

Column 5:
Pan American Production Co., 5-21-41, includes Gillock, except scale starts at 98 cents below 21°.
Stanolind Oil Purchasing Co., 5-21-41, includes Fairbanks, North Houston, and Roslyn.

TEXAS FLAT-PRICE FIELDS

Agua Dulce (light), Benavides, Longhorn, Southland, and Sweden, 5-21-41 ..... $1.35
Agua Dulce (heavy), 10-16-41 ..... $1.25
Republic Oil Refining Co., 5-21-41.
Alfred and Magnolia City $1.35
Continental Oil Co., 5-21-41.
Alice, Benavides (North Sweden), Ben Bolt, Clark-Muil, Sun, and Tom Graham $1.35
Humble Oil & Refining Co., 5-21-41.
Batson (new), Humble (35° and above) Fig Ridge, Hardin, Hull (25° and above), La Belle, North Dayton (25° and above), Seabreeze South China, West Orange, Willow Slough and Oyster Bayou $1.25
Sun Oil Co., 5-21-41.
Cass County $1.20
Texas Co., 5-21-41.
Cayuga, Anderson County $0.90
Pan American Production Co., 5-21-41.

Chapel Hill, Smith County:
Crude distillate $1.30
Crude oil 1.18
Chapel Hill Gas System, 11-7-41.

Clay Creek, Washington County $1.00
Sun Oil Co., 5-21-41.

Cleveland, Liberty County $1.26
Magnolia Petroleum Co., 5-21-41.

Conroe, Montgomery County $1.43
Humble Oil & Refining Co., 5-21-41.
Tide Water Associated Oil Co., 5-21-41.
Sun Oil Co., 5-21-41.
Texas Co., 5-21-41.

Cotton Lake (South) $1.35
Sun Oil Co., 5-21-41.

East Texas and Flag Lake* $1.25
*Humble Oil & Refining Co., 5-21-41.
Pan American Production Co., 5-21-41.
Tide Water Associated Oil Co., 5-21-41.
Gulf Refining Co., 5-21-41.
Magnolia Petroleum Co., 5-21-41.
Sinclair Prairie Oil Marketing, 5-21-41.
Shell Oil Co., Inc., 5-20-41.
Sun Oil Co., 5-21-41.
Texas Co., 5-21-41.
Stanolind Oil Purchasing Co.

Esperson (35° and above), South Esperson $1.30
Sun Oil Co., 5-21-41.

Flour Bluff, East Flour Bluff $1.33
Humble Oil & Refining Co., 5-21-41.

Hockley and Cochran $0.87
Texas Co., 5-21-41.

Livingston and Mercy $1.25
Shell Oil Co., Inc., 5-20-41.

Long Lake $1.23
Sinclair Prairie Oil Marketing, 5-21-41.

Luby $1.35
American Mineral Spirits Co., 5-21-41.

Luling $1.05
Magnolia Petroleum Co., 5-21-41.

Lytton Springs $1.17
Magnolia Petroleum Co., 5-21-41.

Salt Flat, North Salt Flat, Darst Creek*, Hilbig, Clark, Carroll and Zoborski .. $1.41
Humble Oil & Refining Co., 5-21-41.
Magnolia Petroleum Co., 5-21-41.
*Texas Co., 5-21-41.

Rincon (North), Sun, North Sun and Garcia $1.35
Sun Oil Co., 5-21-41.

Yturria $1.45
Sun Oil Co., 3-19-42.

Talco $0.79
Humble Oil & Refining Co., 5-21-41.
Magnolia Petroleum Co., 5-21-41.

Tomball and Satsuma $1.40
Humble Oil & Refining Co., 5-21-41.
*Magnolia Petroleum Co., 5-21-41.
Stanolind Oil Purchasing Co., 4-1-41.

Van, Van Zandt County $1.08
Humble Oil & Refining Co., 5-21-41.
Pure Oil Co., 5-21-41.

Yates (regular) $0.95
Humble Oil & Refining Co., 5-21-41.
Gulf Refining Co., 5-21-41.
Shell Oil Co., Inc., 5-20-41.

Yates (shallow) $0.82
Shell Oil Co., Inc., 5-20-41.

WEST TEXAS, PANHANDLE, AND NEW MEXICO GRAVITY TABLES

	1	2	3	4	5	6	7	8	9	10	11
Below 20	$0.70	....	....	....	....	....	....	....	$0.70	$0.80	....
20-20.9	.72	....	....	....	....	....	....	....	.72	.82	....
21-21.9	.74	....	....	....	....	....	....	....	.74	.84	....
22-22.9	.76	....	....	....	....	....	....	....	.76	.86	....
23-23.9	.78	....	$0.78	....	....	....	....	....	.78	.88	....
24-24.9	.80	....	.80	....	....	....	....	....	.80	.90	....
Below 25	....	$0.80	....	....	....	....	$0.80	....	....	....	$0.90
25-25.9	.82	.82	.82	....	$0.82	....	.82	....	.82	.92	.92
26-26.9	.84	.84	.84	....	.84	....	.84	....	.84	.94	.94
27-27.9	.86	.86	.86	....	.86	....	.86	....	.86	.96	.96
28-28.9	.88	.88	.88	$0.98	.88	....	.88	$0.88	.88	.98	.98
29-29.9	.90	.90	.90	1.00	.90	....	.90	.90	.90	1.00	1.00
30-30.9	.92	.92	.92	1.02	.92	....	.92	.92	.92	1.02	1.02
31-31.9	.94	.94	.94	1.04	.94	....	.94	.94	.94	1.04	1.04
32-32.9	.96	.96	.96	1.06	.96	....	.96	.96	.96	1.06	1.06
33-33.9	.98	.98	.98	1.08	.98	....	.98	.98	.98	1.08	1.08
34-34.9	1.00	1.00	1.00	1.10	1.00	1.10	1.00	1.00	1.00	1.10	1.10
35-35.9	1.02	1.02	1.02	1.12	1.02	1.12	1.02	1.02	1.02	1.12	1.12
36-36.9	1.04	1.04	1.04	1.14	1.04	1.14	1.04	1.04	1.04	1.14	1.14
37-37.9	1.06	1.06	....	1.16	1.06	1.16	....	1.06	....	1.16	1.16
38-38.9	1.08	1.08	....	1.18	1.08	1.18	....	1.08	....	1.18	1.18
39-39.9	1.10	1.10	....	1.20	1.10	1.20	....	1.10	....	1.20	1.20
40 and above	1.12	1.12	....	1.22	1.12	1.22	....	1.12	....	1.22	1.22

WEST TEXAS, PANHANDLE AND NEW MEXICO TABLE EXPLANATION

Column 1:
Humble Oil & Refining Co., 5-21-41, includes Andrews, Crane, Crockett, Ector, Gaines, Glasscock, Howard, Reagan, Upton, Winkler, and Yoakum counties, West Texas, and Lea County, New Mexico.
Gulf Refining Co., 5-21-41, includes Crane, Ector, Upton, Ward, and Winkler counties, West Texas.
Stanolind Oil Purchasing Co., 5-1-43, at Slaughter and Cedar Lake.

Column 2:
Sinclair Prairie Oil Marketing Co., 5-21-41, includes West Texas and Lea County, New Mexico. Effective 5-29-41, in Eddy County, New Mexico.
Magnolia Petroleum Co., 5-21-41, includes Upton, Howard, Glasscock, Mitchell, Winkler, Cochran, Hockley, Yoakum and Gaines counties.

Column 3:
Texas Co., 5-21-41, includes Crane and Winkler counties, Texas, and Lea County, New Mexico.

Column 4 Texas Panhandle:
Magnolia Petroleum Co., 6-16-43.
Continental Oil Co., 6-16-43.*
Phillips Petroleum Co., 6-16-43.*
*Starts at $1 for 29-29.9.

Column 5 Winkler and Lea:
Stanolind Oil & Gas Co., 5-21-41, includes Winkler County only.
Gulf Refining Co., 5-21-41, includes Lea County, New Mexico, only.

Column 6 Gray County:
Texas Co., 6-16-43.
H. F. Wilcox Oil & Gas Co., 6-16-43.

Column 7 Lea County:
Magnolia Petroleum Co., 5-21-41.

Column 8 Eddy County:
Continental Oil Co., 5-30-41.

Column 9:
Shell Oil Co., Inc., 5-20-41, includes Crane, Ector, Howard, Glasscock, Upton, Winkler, and Yoakum counties, Texas, and Lea County, New Mexico.

Column 10 Texas Panhandle:
Humble Oil & Refining Co., 6-16-43.
Gulf Refining Co., 6-16-43.

Column 11 Panhandle:
Sinclair Prairie Oil Marketing Co. 6-16-43.

CANADIAN FIELDS

Imperial Oil, Ltd.:
Petrolia, 11-6-39 ..... $2.10
Oil Springs, 11-6-39 ..... 2.07
Bothwell, 11-6-39 ..... 2.10
Turner Valley, 7-16-41 ..... $1.35-1.97

EASTERN STATES

Pennsylvania and Ohio

South Penn Oil Co.:
National lines, 3-26-42 ..... $3.00
Southwest Penn, 3-26-42 ..... 2.88
Eureka lines, 3-26-42 ..... 2.50
Corning grade, 5-27-41 ..... 1.31

Tide Water Associated Oil Co.:
Bradford, 3-26-42 ..... $3.00
Allegany, N. Y., 3-26-42 ..... 3.00

Pennzoil Co.:
Group A, 3-26-42 ..... $2.93
Group B, 3-26-42 ..... 2.93
Group C, 3-26-42 ..... 2.91
Group D, 3-26-42 ..... 2.90
Group E, 3-26-42 ..... 2.88

Quaker State Oil Refining Corp.:
In Buckeye lines, 3-26-42 ..... $2.55
In Eureka lines, 3-26-42 ..... 2.50

Kentucky

Ashland Oil & Transportation Co., 6-19-41:
Big Sandy River (8-9-43) $1.43
Kentucky River (6-19-41) 1.43

Sohio Corp., 5-21-41:
Birk City $1.33

Western Kentucky

All purchasers, 8-9-43:
Henderson, Webster, McLean, Daviess,

(Continued on page 107)

STANDARD OIL CO. OF CALIFORNIA CRUDE-OIL PRICES EFFECTIVE APRIL 1, 1943

Gravity	Signal Hill (Long Beach)	Wilmington	Seal Beach	Huntington Beach	Inglewood	Olinda-Brea Canyon	Torrance	Richfield	Whittier East Coyote (La Habra)	Montebello	West Coyote Hills	Santa Fe Springs	Greeley, Canal, Wasco	Coles Levee	Mountain View	Elk Hills, Buena Vista Hills Midway-Sunset, Lakeview area	Coalinga	Kettleman Hills	Elwood Terrace
14-14.9	....	$0.93	....	$0.96	....	$0.95	$0.95	$0.95	$0.95	$0.97	....	....	....	....	....	$0.98	$0.98	....	....
15-15.9	....	.96	....	1.00	$1.01	.97	.97	.96	.97	.97	....	....	....	....	....	.98	.98	....	....
16-16.9	....	.96	....	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	....	.98	.98	....	....
17-17.9	....	.96	....	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	....	.98	.98	....	....
18-18.9	$0.93	.96	....	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	....	.98	.98	....	....
19-19.9	.93	.96	....	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	$0.98	.98	.98	....	....
20-20.9	.93	.96	....	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	.98	.98	.98	....	....
21-21.9	.93	.96	....	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	.98	.98	.98	....	....
22-22.9	.96	.98	$0.88	1.00	1.01	.97	.97	.96	.97	.97	....	....	....	....	.98	.98	.98	....	....
23-23.9	1.00	1.02	.92	1.02	1.01	.98	.97	.98	1.00	.97	....	....	....	....	.98	.99	.98	....	....
24-24.9	1.03	1.06	.97	1.05	1.04	1.01	1.01	1.02	1.03	.97	$0.99	....	....	....	.98	1.03	.98	....	....
25-25.9	1.07	1.09	1.01	1.08	1.07	1.04	1.05	1.06	1.07	.98	1.02	....	....	....	.98	1.07	.98	....	....
26-26.9	1.11	1.12	1.06	1.11	1.10	1.08	1.09	1.10	1.11	1.01	1.06	....	....	....	.98	1.11	.98	....	....
27-27.9	1.15	1.15	1.10	1.14	1.14	1.11	1.13	....	1.15	1.05	1.10	$1.04	....	....	1.01	1.15	.98	....	....
28-28.9	1.18	1.18	1.15	1.17	1.17	1.14	1.17	....	....	1.08	1.13	1.08	....	....	1.04	1.19	1.00	....	....
29-29.9	1.20	1.21	1.19	1.20	1.20	....	....	....	....	1.12	1.17	1.12	....	....	1.07	1.24	1.02	....	f.o.b.
30-30.9	1.23	1.24	....	1.23	1.22	....	....	....	....	1.15	1.21	1.15	$1.01	$1.09	1.10	1.28	1.04	....	ship
31-31.9	....	....	....	....	1.24	....	....	....	....	1.19	1.24	1.19	1.04	1.12	1.14	....	1.06	....	....
32-32.9	....	....	....	....	....	....	....	....	....	1.23	1.28	1.23	1.07	1.14	1.17	....	1.09	....	....
33-33.9	....	....	....	....	....	....	....	....	....	1.27	....	1.26	1.10	1.17	....	....	1.11	....	$1.22
34-34.9	....	....	....	....	....	....	....	....	....	1.31	....	1.30	1.13	1.20	....	....	1.13	....	1.25
35-35.9	....	....	....	....	....	....	....	....	....	1.35	....	....	1.16	1.22	....	....	....	$1.23	1.28
36-36.9	....	....	....	....	....	....	....	....	....	1.39	....	....	1.19	1.25	....	....	....	1.26	....
37-37.9	....	....	....	....	....	....	....	....	....	1.43	....	....	1.22	....	....	....	....	1.29	....
38-38.9	....	....	....	....	....	....	....	....	....	1.47	....	....	1.25	....	....	....	....	....	....
39-39.9	....	....	....	....	....	....	....	....	....	1.51	....	....	....	....	....	....	....	....	....
40-40.9	....	....	....	....	....	....	....	....	....	1.53	....	....	....	....	....	....	....	....	....

Standard posts 94 cents for 12 gravity and 96 cents for 13 gravity in San Joaquin fields, effective May 25, 1943.

LA.-ARK.

Miller County Well May Be Classed as New Oil Pool

SHREVEPORT, La. — Steps were being taken last week to prevent the new well of Arkla Oil Co. in Miller County from being classified as a gas-distillate producer. Later reports indicate that the well made a flowing potential of 132 bbl. of high-gravity oil a day. Production is in the Hill sand at 4,940-70 ft. Although it is said the oil is 48 gravity, it is a black crude and there is considerable gas. Classification of the new area will be determined at the state-wide hearing of the Oil and Gas Commission at Magnolia, October 30.

ARKANSAS WILDCAT COMPLETIONS

Catahoula Parish: Sinclair Prairie 1 Gra- Co., SW SW 12-16s-14w, dry, T.D. 3,067 ft.

NORTH LOUISIANA WILDCAT COMPLETIONS

Catahoula Parish: Sinclair Prairie 1 Graham, NW SE 30-9n-7e, dry, T. D. 8,703 ft., Midway 5,823 ft., lime 8,680 ft.

Jackson Parish: Mid-Continent Pet. 1 Tremont Lbr. Co., SE SE NE 31-15n-3w, approx. tops massive anhydrite 6,025 ft., Pettit 7,290 ft., D.S.T. 7,290-7,350 ft. recovered mud, perf. 7,323-43 ft., 7,293-7,320 ft. and swabbed salt water, P.B. approx. 6,700 ft. in James limestone, swabbed salt water, dry, T.D. 8,319 ft.

MISSISSIPPI

Adams County Wilcox Discovery Tests 280 Bbl.

JACKSON, Miss.—Wilcox oil production was assured at Cranfield area in Adams County as California Co. 1 National Gas Co. of Louisiana, Inc., continued testing in that formation. Several tests had been run in the Wilcox at the 4,388-ft. and 5,880-ft. levels. Test at 5,880-84 ft. had flowed 280 bbl. daily, gravity 44, ¼-in. choke, T.P. 520 lb., G.O.R. 175-1, but plug was set above these perforations, perforatons left open, and new holes made at 4,388-92 ft. where tests flowed oil with salt water. These perforations were squeezed. This wildcat also had showed up for a gas-distillate well at the 10,270-ft. level.

While Gulf 1 Davis, discovery well of the Encutta field, was awaiting completion in the Tuscaloosa, a second well, ¾ mile to the north northeast, recovered 550 ft. of oil in a drill-stem test of the Eutaw. This is Gulf 1 Stanley, NE SW 36-10-9w, in Wayne County. Drilling is continuing, presumably to the Tuscaloosa. Eutaw production has now been found completely across the state and this discovery suggests an extension of Mississippi's principal pay to date into Alabama.

One other field opener in Mississippi was waiting on pumping equipment to complete, being the Love Petroleum Co. 2 John Anderson, discovery well of the Flora area in Madison County, Section 2-8n-1w.

F. H. Shortridge et al was rigging up the 1 Elijah Sutherland, new wildcat in Madison County, 330 ft. north and east of southwest corner of 1-11n-3e.

Humble Oil & Refining CCo. 1 I. A. Hurst, wildcat in Section 33-5s-8w, in Greene County, drilled ahead below 9,890 ft. in sand.

MISSISSIPPI WILDCAT COMPLETIONS

Bolivar County: Hunt Oil Co. 1 L. C. Raymer, NW NE 4-23n-5w, dry, T.D. 5,557 ft., Midway 2,493 ft., sand 4,170 ft., top Paleozoic 5,014 ft.

Lawrence County: Gulf 1 James A. Cox, NE NE 35-7n-10e, dry, T.D. 2,771 ft.

Pontotoc County: S. A. Guiberson 1 Edward Hale, W½ E½ 3-10s-3e, dry, T.D. 2,233 ft. in Fort Payne chert.

Stone County: Harry I. Morgan 4 L. N. Dantzler, SW NW 30-2s-12w, dry, T.D. 8,575 ft., Claiborne lime 2,394 ft., Wilcox 2,810 ft.

FLORIDA

Humble Oil & Refining Co. was preparing for first production test in the 1 Gulf Coast Realties Co., wildcat in the Suniland area of Collier County, 49-48s-30e. With total depth 11,626 ft., casing has been set to test shows in deep lime sections.

OKLAHOMA

Canadian County Wildcat Is Probable Hunton Discovery

ONE of the most interesting wildcat wells in Oklahoma last week was Ace Gutowsky's 1 Watson, SE SE SW 23-14n-5w, about 3 miles northwest of the West Edmond pool in Canadian County. Seven-inch casing was set at 7,382 ft., after drilling to 7,400 ft. At the first of this week operators had drilled the plug and were moving in standard tools to complete. Electric log showed possible oil and gas in the Hunton lime around 7,250 ft., and also a show in the Oswego at 6.745 ft.

Two new gas wells, in old areas, were brought in last week. In the heart of the Edmond field, Ohio Oil Co. 13 Dahl, NW SE SE 31-14n-3w, blew wild with an estimated 25,000,000 cu. ft. of gas a day when crews were trying to salvage casing. The well was an abandoned producer, having been completed 10 years ago. Source of the gas was undetermined but the flow started when the pipe was shot off at 4,700 ft. In Payne County, Skelly Oil Co. 1 Simpson, SW SW SE 30-19n-5e, gaged 34,850,000 cu. ft. gas in Misener sand at 3,633-74 ft. Location is west of the old shallow Ingalls pool. About two weeks ago, Sinclair-Prairie opened a gas zone in the north part of the old Britton field of Oklahoma County. This well flowed an estimated 30,000,000 cu. ft. in the Oswego lime at 6,094-6.129 ft.

OKLAHOMA WILDCAT COMPLETIONS

Greer County: S. M. Stauffer 1 Beauchamp, NE SE 1-4n-21w, dry, T.D. 1,107 ft.

Johnston County: A. K. Hammer 1 Aubrey, NW SW SW 8-2s-8e, dry, T.D. 1,960 ft., sand 1,805 ft.

Pawnee County: Zephyr Drlg. 1 Huffington, SE SW SW 12-20n-5e, dry, T.D. 3,700 ft., Bartlesville 3,440 ft., Wilcox 3,689 ft.

Payne County: L. B. Jackson 1 Hudson, NE NW 10-19n-5e, dry, T.D. 3,675 ft., Viola 3,619 ft., Wilcox 3,662 ft.

Pottawatomie County: Cities Service 1 Lamirand, NE SE SW 27-6n-2e, pumped 51 bbl., Wilcox 5,118-30 ft., T.D. 5,304 ft., gravity 36.

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WILDCATS AND DISCOVERIES

THE week's crop of completed discovery wells was slightly above the normal record for the year. None of the fields opened, however, appear to be of major importance.

The increasing activity in the Rocky Mountain area was reflected in three discoveries in Montana, all on the Sweetgrass arch and all in the Sunburst sand. Two of the discoveries were small oil wells, opening the Brady and Midway pools, in the Pondera district and the third was a gas well southwest of the Kevin-Sunburst field.

Southwest Texas shared honors with Montana, having three oil discoveries. The Loma Novia sand again paid off on the trend extending south from Duval through Jim Hogg County and Henderson Coquat completed his second recent Wilcox discovery in Live Oak County. This field, 1½ miles from the Goebel field, may eventually merge with it. The third find was a small well ½ mile east of the recent gas discovery at Blanconia in Bee County. These also may prove to be a single producing pool.

The most important discovery of the week was probably Beacon Oil & Refining Co.'s Pettit lime pool northwest of Henderson in Rusk County. This pool lies just east of the East Texas field but, of course, does not indicate any deep possibilities for that field, since it is a stratigraphic trap. Also, in East Texas, a new gas-producing area was opened up on the southwest flank of the Sabine uplift. In North Texas, a small discovery well in Throckmorton County opened a new Caddo lime area but made about 40 per cent water.

Illinois and Indiana had one McClosky lime producer each. The former was a relatively small well for a McClosky discovery, making only 210 bbl. and the fact that it carried water suggests a small pool, similar to the neighboring Mason and South Mason pools. Indiana's discovery was a 150-bbl. well in the extreme southern tip of the state, near the Point pool.

Oklahoma's single discovery was a small Wilcox sand pumper in Pottawatomie County west of Wanette, while in Kansas a small gas well opened a new pool near Kansas City. In California, the only discovery was a gas sand in the West Raisin City pool found after plugging back from the deeper oil pay.

WILDCAT COMPLETIONS

	Week ended October 9, 1943					Cumulative total for 1943				
	Oil	Distillate	Gas	Dry	Total	Oil	Distillate	Gas	Dry	Total
Ohio	0	0	0	2	2	4	0	20	37	61
Indiana	1	0	0	0	1	3	0	0	48	51
Kentucky	0	0	0	4	4	18	0	2	98	118
Illinois	1	0	1	5	7	54	0	3	322	379
Michigan	0	0	0	10	10	9	0	1	118	128
Kansas	0	0	1	3	4	50	0	1	277	328
Nebraska-Missouri-Iowa	0	0	0	1	1	0	0	0	19	20
Oklahoma	1	0	0	11	12	37	1	14	213	265
Texas:										
North Central	1	0	0	3	4	44	0	1	277	322
West	0	0	0	1	1	9	0	1	64	74
Panhandle	0	0	0	0	0	0	0	0	5	5
East	1	0	1	0	2	5	0	2	83	90
Gulf Coast	0	0	0	5	5	4	7	6	87	104
Southwest	3	0	0	6	9	21	11	3	219	254
Total	5	0	1	15	21	83	18	13	735	849
Louisiana:										
North	0	0	0	2	2	4	0	3	56	63
Gulf Coast	0	0	0	0	0	12	6	1	24	43
Total	0	0	0	2	2	16	6	4	80	106
Arkansas	0	0	0	1	1	2	0	0	52	54
Mississippi and Southeast	0	0	0	4	4	3	0	0	48	50
Montana	2	0	1	1	4	4	0	1	17	22
Wyoming	0	0	0	1	1	6	0	0	15	21
Colorado, Utah	0	0	0	1	1	0	0	1	3	4
New Mexico	0	0	0	0	0	5	0	2	20	27
California	0	0	1	7	8	5	0	9	113	127
Total United States	10	0	5	68	83	299	25	71	2,215	2,610
Total previous week	5	0	3	59	67					

Industry Assigned Scrap Quota of 180,000 Tons

WASHINGTON, D. C.—Petroleum Administrator Ickes last week called upon the oil industry to contribute at least 180,000 tons of scrap metal to the national scrap pile during the 3 months ending in December.

The request was made in conjunction with the salvage drive that began on October 1 under the direction of the Salvage Division of WPB.

Deputy Administrator Ralph K. Davies said that the petroleum industry should have no difficulty in meeting its quota. He pointed out that, in July, oil men had collected 42,600 tons of scrap metal.

Crude-Oil Prices

(Continued from page 105)

Union and Muhlenberg counties..$1.37
Butler County 1.32
Bowling Green area 1.17

West Virginia

Pure Oil Co.:
Cabin and Kelly Creek, 3-27-42 $2.50

ROCKY MOUNTAIN GRAVITY TABLE

Below 29	$0.96
29-29.9	.98
30-30.9	1.00
31-31.9	1.02
32-32.9	1.04
33-33.9	1.06
34-34.9	1.08
35-35.9	1.10
36-36.9	1.12
37-37.9	1.14
38-38.9	1.16
39-39.9	1.18
40 and above	1.20

Stanolind Oil & Gas Co., 5-20-41, includes Dutton Creek, Midway, and Salt Creek except Tensleep crude, Wyoming.
Sinclair-Wyoming Oil Co., 5-20-41, includes Salt Creek and Lost Soldier, except Tensleep crude, Wyoming.
Continental Oil Co., 5-21-41, includes Fort Collins and Wellington, Colorado.

Wyoming

Ohio Oil Co.:
Reck River (5-20-41) $1.10
Lance Creek (7-1-41) 1.12
Elk Basin and Grass Creek (light).. 1.00
Elk Basin (heavy) (4-28-43) ..... .90
Grass Creek (heavy) (4-1-43) ..... .85
Stanolind Oil & Gas Co.:
Frannie (light) (4-1-43) $0.85
Frannie (heavy) (4-1-43) ..... .62
Grass Creek (light) (5-20-41) 1.00
Grass Creek (heavy) (4-1-43) ..... .85
Elk basin (5-20-41) 1.00
Salt Creek (Tensleep) (4-28-43) ..... .90
Continental Oil Co.:
Big Muddy (5-30-41) $1.08
Lance Creek (9-1-41) 1.12

Montana

Continental Oil Co., 4-1-41:
Cat Creek $1.15

Colorado

Stanolind Oil & Gas Co., 5-20-41:
Iles $1.07
Continental Oil Co., 5-21-41:
Canon City-Florence $1.05

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1 Always include at least one Borium insert at the lower, outside corner of each cutting wing to prevent "diamond pointing." (Sketch)

2. On bits larger than 6 inches O.D a second Borium insert on the lower cutting edge improves drilling efficiency. (Sketch)

3. Cover leading faces of all bit wings with Tube Borium, using screen size of at least 10-20 mesh rather than finer meshes such as 30-40. Tests conclusively prove the larger Borium particles greatly increase drilling speeds.

4. Don't skimp on quantity. Tests show that bit life and efficiency is in direct proportion to the amount of Tube Borium applied (up to 1/8" in thickness).

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Among the Drilling Contractors

San Joaquin Drilling Co., a newly organized drilling company of which W. W. Cline and E. E. Whippel are the principals, has the contract to repair Continental Oil Co. 1 Meyer in the deep Wasco field, California. This well went to water a week or so ago and it is believed a recement job will remedy the difficulty.

Scott and Marrs have the contract on American Production Co. 2 Don H. Compson, in C NW 6-16n-7w, Mecosta County, Michigan.

Petroleum Well Service Co., Houston, Tex., received contract from Shell Oil Co., Inc., to drill the latter's 3 C. S. Baldwin, 660 ft. south and 1,980 ft. west of northeast corner of Section 28-6s-9w. This test is contracted to the field's Frio pay zone, near 6,600 ft.

California Commercial Drilling Co. has been awarded contract for the drilling of Quality Oil Co.'s No. 8 well in the Midway-Sunset field, Kern County, California.

Cron & Gracey Drilling Corp., Houston, Tex., is drilling 12 Pelican, in the Gibson field, Terrebonne Parish, Louisiana, for Shell Oil Co., Inc. It has the contract for a workover job on 1 State-Lake Long, in the Lake Long field, La Fourche Parish, for Fohs Oil Co.

Jack W. Frazier, Houston, Tex., has the contract on J. M. Frost III 4-A fee test in Section 96, H.T.&B. Survey, Fig Ridge field of Chambers County, Texas, and will move the rig from Frazier, Ranger & Ogden's wildcat just northeast of Algoa as soon as the latter test is completed.

Long Beach Oil Development Co., which has completed plans for the drilling of 25 new wells during the next few months has awarded drilling contracts for 2 wells to **Dunlap & Graham** and contracts for 3 wells to **Hiles Drilling Co.**

Albert Maring has contract on the Jacob Bolema 1 Henry A. and Agnes Kops, in NE NE SE 9-11n-16w, Muskegon County, Michigan.

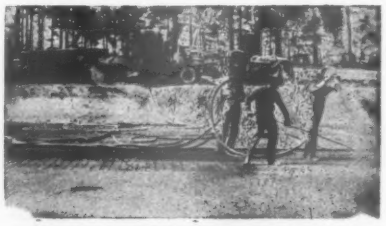
Morris - Hamilton, Houston, Tex., active in the Vinton field of Calcasieu Parish on Union Oil Co. of California's Gray et al lease, was awarded the contract for that company's latest location in the area, the 15-G Gray et al.

Bell & Loffland are drilling 3 wells for Union Pacific Railroad Co. in the Wilmington field, California, and will probably start on several additional wells in the near future as Union Pacific has 15 locations staked for new wells. **Drilling & Exploration Co.,** which is drilling one well for Union Pacific, will also probably take over additional drilling activities if crews become available.

H. H. McClure has the drilling contract on 1 Henrietta Elfers, in SE SE SE 4-5n-15w, Ottawa County, Michigan.

Manning & Brown, Inc., Denver, Colo., has been awarded drilling contract for Ohio Oil Co. 1 Nordloh, a projected 8,000-ft. wildcat test 12 miles southeast of Greeley, near the town of Kuner, and 18 miles southwest of the Greasewood pool. Location is C SE SE 20-5n-63w, Weld County, Colorado.

Al Buchanan, of San Antonio, Tex., has the contract to drill Butcher-Arthur, Inc.'s, 10,000-ft. wildcat 2 miles southeast of Gregory in San



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Patricio County, Texas. This is the 1 James F. Green estate, 1,980 ft. from east and 3,300 ft. from north line of 4,529-acre lease in G. Valdez, J. Gerraghty and T. T. Williamson Surveys.

Geo. P. Livermore, Lubbock, Tex., has contracted to drill a San Andres lime test 2 miles north of production in Yoakum County. It will be Paul G. Schaefer 1 Mattie Farmer, SW SW Section 635, Block D, J. H. Gibson Survey, Livermore is drilling below 2,500 ft. on Brown & Wheeler's Earl French wildcat in northwest Hockley County after setting 8⅝-in. casing below 2,100 ft.

George Donnelly, Fort Worth, Tex., is drilling below 3,300 ft. in lime on Bryce McCandless 1 W. W. Turney, Pecos County, Texas, wildcat in Section 19, Block 140, T.&St.L. Survey. Cavities in the area have been troublesome, causing lost circulation. The test is to go to 5,500 ft., or granite or production.

Taubert & McKee, drilling contractors for the Jesse Martin and others 1 England, Ellenburger wildcat test 2 miles north of Keller, Tarrant County, Texas, reports that the test was drilling below 5,435 ft. in sand, softening up, but with no shows reported yet.

M. J. Delaney, drilling contractor of Dallas, Tex., has the contract on Gulf Oil Co. 1 C. C. Garrett, in the L. Williams Survey in the Pittsburg field, Camp County, Texas. In the same survey, Delaney has contract on H. S. Moss 1 Claude Williams, which is en route to the regular pay around 8,100 ft. It topped the Georgetown lime at 4,540 ft. and found the top of the Paluxy at 5,660, with elevation of 406 ft.

Crescent Drilling Co. has the contract on Mid-Continent Petroleum Corp. 1 Louisiana Long Leaf Lumber Co., in NW SW 28-7n-12w, Sabine Parish, North Louisiana.

Beacon Drilling Co. has the contract for Consolidated Gas and Oklahoma Natural Gas Co. 1 Freeman, in C NW NE 7-9n-21w, Beckham County, Oklahoma, about 10 miles east of Sayre. Contractors were rigging up for a 5,500-ft. test.

Labor Shortage Holds Contractors' Interest

(Continued from page 35)

B. King Drilling Co., Midland, Tex., in his paper, "Need for Continuity of Operations."

In his talk on "The Place of the Drilling Contractor in the Oil Industry," Chase Sutton, Pure Oil Co., Houston, Tex., stated that the contractor through his services provides for the industry the most effective and economical utilization and efficient use of material, manpower and supplies.

In discussing the achievements and aims of the association, A. H. Rowan, Rowan Drilling Co., Fort Worth, Tex., who was elected president for the ensuing year, said that the drilling contractor would have to change to meet the evolution of the times. The purpose of the drilling contractor's association is to solve mutual problems, improve relationship among contractors, contracting and producing organizations and employers and employes, and to improve machinery, equipment, drilling practices and the efficiency of the personnel. Wage policies should evidence an intelligent effort to improve the status of those employed in the drilling industry. The association's effort in preventing the elimination of the charge-off of drilling expense and the elimination of WLB wage zones have been outstanding accomplishments.

Sound Accounting Urged

W. K. Powell, Two States Drilling Co., Dallas, talked on sound accounting practices and discussed this phase of the drilling business as an offensive and defensive weapon. Rule-of-thumb methods, while necessary, are only as good as the records upon which they are based and their accuracy depends on the frequency of calibration with an accounting system.

In addition to the selection of Mr. Rowan as president to succeed N. H. Wheless, Shreveport, La., the association elected the following:

H. L. Sullivan, Loffland Brothers Drilling Co., Tulsa, vice president at large; J. E. Warren, Carl B. King Drilling Co., Midland, vice president for rotary tools; Ben M. McGraw, Carmi, Ill., vice president for cable tools; K. B. Knox, Petroleum Well Servicing Co., Houston, vice president for well-servicing tools.

Regional vice presidents are John Chapman, Grey Wolf Drilling Co., Houston; H. S. Connelly, Harbar Drilling Co., Wichita, Kans.; Cyrus Bell, Bell & Loffland, Los Angeles, Calif.; C. M. Ashby, Ashby Drilling Co., Grand Haven, Mich. Treasurer is Harry W. Bass of Dallas, and Brad Mills, Dallas, is secretary.

New men chosen for directors of the association were: Tom P. Pike, Los Angeles; Les Sheppard, Bakersfield, Calif.; H. I. Morgan, Shreveport; Fred Stovall, Monroe, La.; C. M. Ashby, Grand Haven, Mich.; Mr. Connelly, Wichita; J. Ross McGill, Amarillo, Tex.; A. S. Ritchie, Wichita; Gifford Parker, Tulsa; E. J. Nicholos, Houston; Cyrus Bell, Los Angeles; Mr. Sullivan, Tulsa; Frank Porter, Oklahoma City, Okla.; Mr. Warren, Midland, and Charles Alcorn, Houston.

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PERSONALS

W. L. KYGAR

Study As Assistant Leads to Higher Drilling Post

W. L. KYGAR, assistant manager of the production and drilling department, Continental Oil Co., was born in Ponca City, Okla., attended the grade and high schools there, and was graduated from the University of Oklahoma.

He joined the organization in 1926 as a meterman for the Ponca City Gas Distributing Co.

On June 1, 1928, he was transferred to pipe line accounting and held various positions in this division, becoming chief clerk in 1930. He was promoted to be chief clerk of the production and drilling department in 1935, and was named assistant to the manager in 1936.

Mr. Kygar was appointed assistant manager, production and drilling department, east of the Rocky Mountains, on May 1, 1943.

J. L. Fitz Patrick, scout for Tide Water Associated Oil Co. at Evansville, Ind., has been transferred to Midland, Tex., where he will succeed **Collie Falk** as scout in the West Texas district.

K. B. Nowels, Abilene, Tex., former chief engineer and geologist for Forest Development Corp., has become associated in a new firm, Hunter, Nowels & Hunter, which will be concerned exclusively with stripper properties which are suitable for water-flooding operations. In the new firm he is associated with **J. C. Hunter,** president of the Mid-Continent Oil and Gas Association, and **J. C. Hunter, Jr.** Since resigning from Forest Development in 1939, Mr. Nowels has installed several floods for Dean Brothers of Fort Worth, Tex., in Throckmorton, Shackelford and Callahan counties, Texas.

C. J. Loetterle, Sun Oil Co., was elected president of the East Texas Geological Society at the regular annual election last week. **B. W. Allen,** Gulf Oil Corp., was elected vice president; **Lyn L. Hardin,** Sinclair Prairie Oil Co., secretary-treasurer, and **J. H. McGuirt,** Magnolia Petroleum Co., chairman of the executive committee.

James S. Noland, for many years land man for Barnsdall Oil Co. at Midland, Tex., and lately of Tulsa, has returned to Midland to be land man for Phillips Petroleum Co. in the West Texas district.

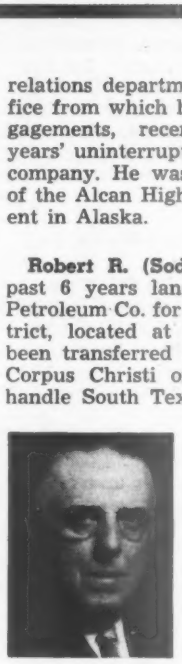
Warner Clark, chairman of the conservation committee of California Oil Producers, has appointed **Robert M. Allan, Jr.,** Superior Oil Co.; **L. A. Cranson,** Honolulu Oil Corp.; **Olen Lane,** Continental Oil Co.; **Ross McCollum,** National Oil Co.; **B. E. Parsons,** General Petroleum Corp.; **R. C. Patterson,** Belridge Oil Co., and **C. P. Watson,** Seaboard Oil Co., as members of a committee to study and make a recommendation on the proposed regulations for oil and gas unit plan being sponsored by the U.S.G.S. and its possibility of successful application in California fields.

Shifts: **W. Neilson,** enginer, Shell Oil Co., Inc., Oilfields, to Sacramento, Calif.; **H. D. Spires,** engineer, Tide Water Associated Oil Co., Kilgore, to Cayuga, Tex.; **Ira O. Walker,** superintendent, Pan American Production Co., Lockport, La., to Dickinson, Tex.; **C. L. Kelly,** engineer, Stanolind Oil & Gas Co., Athens, to Longview, Tex.

James N. Gregory, who has been exploitation engineer in Shell Oil Co., Inc.'s Los Angeles office, has been transferred to the San Joaquin division as field engineer in oil-field service.

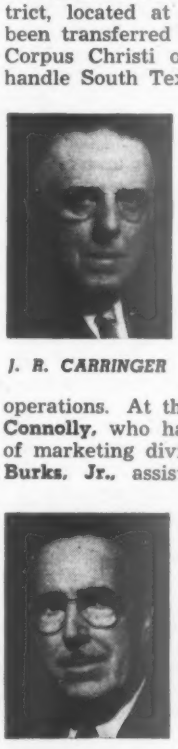
Hugh Matier, for several years resident manager in the coastal district of California for Union Oil Co., and recently a member of the public-relations department at the home office from which he fills speaking engagements, recently completed 25 years' uninterrupted service with the company. He was an early advocate of the Alcan Highway and is at present in Alaska.

Robert R. (Sody) Herrell, for the past 6 years land man for Phillips Petroleum Co. for the West Texas district, located at Midland, Tex., has been transferred as land man to the Corpus Christi office of Phillips to handle South Texas.

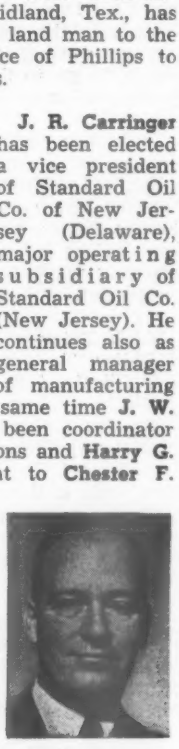


J. R. CARRINGER

J. R. Carringer has been elected a vice president of Standard Oil Co. of New Jersey (Delaware), major operating subsidiary of Standard Oil Co. (New Jersey). He continues also as general manager of manufacturing operations. At the same time **J. W. Connolly,** who has been coordinator of marketing divisions and **Harry G. Burks, Jr.,** assistant to **Chester F. Smith,** president of the operating company, have been made directors. Mr. Carringer came to the Bayway, N. J., refinery in 1918 as assistant general superintendent, and became manager of the plant in 1926. He was promoted to assistant general manager of the three New Jersey plants in 1936 and became a director of the "Delaware company," as the operating unit is familiarly known, 4 years later. Mr. Connolly, who joined the Standard organization in 1933 as fuel-oil sales manager, has been 27 years in the oil business, having started with the Mexican Petroleum Corp. in 1916. Dr. Burks came with Standard as chemical engineer in 1924 follow-



J. W. CONNOLLY



H. G. BURKS, JR.

ing his graduation from the University of Virginia and Massachusetts Institute of Technology. He was made manager of the technical-service division of the operating unit in 1936, as well as technical adviser to the vice president in charge of manufacturing. In 1940 he became assistant to the president of the Delaware company.

J. L. Risinger, safety engineer for Socony-Vacuum Oil Co., Inc., last week was elected general chairman of the petroleum section, National Safety Congress, at the thirty-second annual meeting in Chicago, Ill.; **J. L. Manes,** Dallas, Tex., safety and personnel director for Sun Oil Co., Southwest division, was reelected vice chairman, production; **A. H. Vineyard,** Shell Oil Co., Inc., New York, vice chairman, marketing; **E. K. Alexander,** Tulsa, Texas Co., vice chairman, pipe line; **J. C. Askam,** Ohio Oil Co., Findlay, Ohio, vice chairman, manufacturing; and **A. J. Gorand,** Sun Oil Co., Philadelphia, Pa., chairman, engineering committee.

A. P. Stover, for several years assistant general manager of the manufacturing department of Ethyl Corp., has been named director of employe relations, a newly created executive position within the company. He will make his headquarters in New York. He joined the manufacing department as a chemist at the Deepwater, N. J., plant in December 1927 and was made assistant plant manager a year later. Subsequently he was put in charge of plant operations there. In 1939 he went to the Baton Rouge, La., plant as assistant general manager of the manufacturing department, remaining there until early 1942 when expanding duties made it necessary for him to move to the executive offices in New York.

R. P. Reid, in charge of the new Rocky Mountain area office of the Phillips Petroleum Co. at Denver, has had the San Juan basin, northwestern New Mexico, placed under his jurisdiction, and his territory now includes Northwest New Mexico, Colorado, Wyoming and Montana to the Canadian border. The company is drilling a wildcat in Archuleta County, in the San Juan basin.

Charles A. Miller, past chairman of the petroleum section of the National Safety Council, and southern division manager of the personnel department of Texas Co., Houston, Tex., office, and in charge of safety for the firm, has been elected president of the "Veterans of Safety," the election taking place during the National Safety Congress. Veterans of Safety is an honorary society of safety engineers in the United States and Canada, who have had 15 years or more experience in the safety-engineering field.

R. E. Foss, recently appointed general superintendent of operations in the California division of Barnsdall Oil Co., has returned to his Los Angeles office from a general inspection of the company's San Joaquin Valley holdings.

Joe R. Williams, former employe of Humble Oil & Refining Co., Houston, Tex., has been promoted from captain to major and awarded the Air Medal. Major Williams commands a fighter squadron in England. He was commissioned at Luke Field, Arizona, in February 1942.

Phillip H. Patchin, vice president of Standard Oil Co. of California, has retired after 24 years of service. Since March 1942, until his recent return to California, he has been stationed at Washington, D. C. He is now at his home in Burlingame, convalescing from an illness. Mr. Patchin joined Standard of California in 1919, following newspaper and government work. He was elected a director in 1935, and a vice president in 1942.

A. R. (Ray) Austin, after many years with Atlantic Refining Co., recently resigned his position as geophysical coordinator with that company to enter the magnetometer contracting field, with headquarters in Dallas, Tex.

Leslie Bowling, Union Oil Co. of California, last week was elected president of the Houston (Tex.) Geological Society. Other officers elected were: **W. B. Milton, Jr.,** Gulf Oil Corp., vice president; **W. B. Moore,** Atlantic Refining Co., secretary; **G. J. Smith,** Pan American Producing Co., treasurer; and **S. G. Gray,** Tide Water Associated Oil Co., **Shirley L. Mason,** Stanolind Oil & Gas Co., and **Joseph Hornberger, Jr.,** independent, members of the advisory committee.

F. E. Thompson, superintendent of Warren Petroleum Corp.'s gasoline plant at Salem, Ill., for the past 3 years, has been transferred to Madill, Okla. He will be succeeded at Salem by **C. V. Quinn,** who has been transferred from Madill.

J. B. Denton, who prior to entering the armed forces was Texas Co. landman in Mattoon, Ill., is now at South Dakota State College at Brookings, attending an Army administrative school.

Tex Bradford, oil-well fire fighter of South Texas, who 3 years ago went

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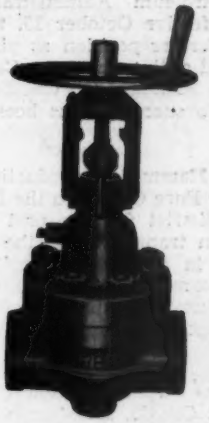

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to England as a specialist in the Canadian Army, has returned to the United States, after having seen service in several countries in Asia, Africa and Europe. He wrote friends in San Antonio, telling them something of his experiences, and mentioning oil men he had encountered in his journeys.

James Terry Duce has resigned as director of the Foreign Division of the Petroleum Administration for War, effective October 15, to return to his former position as vice president and a director of the California-Arabian Standard Oil Co., San Francisco. No successor has been named as yet.

Don Hammond, production foreman for Pure Oil Co. in the Healdton, Okla., district for the past 5 years, has been transferred to the Cushing district in a similar capacity. **John Clark,** formerly attached to the Cushing district production office, has been appointed foreman at Healdton.

George M. Dixon, Tide Water Associated Oil Co. sales executive now on leave for military service, has been promoted to the rank of commander in the Naval Reserve. He has been with Tide Water since 1928, and in recent years was coach of the San Francisco Olympic Club's basketball teams.

B. E. Sibley, Continental Oil Co., Ponca City, Okla., is general chairman of a meeting of the Society of Automotive Engineers at Tulsa, November 4-5, which will feature a discussion of wartime needs and problems in the field of fuels and lubricants.

Kenneth Gilson, a treater in Pure Oil Co.'s Cabin Creek, W. Va., refinery before entering the armed services, has been promoted and commissioned a lieutenant colonel.

Clarence R. Stout has been appointed assistant maintenance foreman at Pure Oil Co.'s Smiths Bluff, Tex., refinery. He was transferred to the Texas plant from the Heath, Ohio, refinery.

Wiley Brooks, Robert Warren and **Donald Snyder,** previously employes at the Toledo, Ohio, refinery of Pure Oil Co., have been honorably discharged from the Seabees, Navy and Army, and returned to their civilian jobs.

W. C. Kinsolving, general superintendent for Sun Pipe Line Co., Beaumont, Tex., before entering government service, has resigned as assistant director of the PAW Transportation Division to accept a commission as a colonel in the Corps of Army Engineers. He reported for duty in Washington October 11, but expects to be assigned to foreign service in the near future.

Francis J. Connor has been appointed publicity assistant to the chairman of the Petroleum Industry War Council. Mr. Connor has had several years of newspaper experience in Washington and on the Daily News in Chicago, and for the past 2 years has been a member of the Washington Bureau of the Chicago Sun.

Frank W. Simms, formerly with N. Appleman Co. in Wichita, Kans., has been named Kansas manager for Sohio Oil Co. **John Riise,** who goes to Kansas from Texas, has been made production superintendent of the company, and will reside in Russell, Kans.

R. E. Nelson, Jr., assistant division landman of Stanolind Oil & Gas Co. in Fort Worth, Tex., has been promoted and transferred to Tulsa. He will assume his new duties October 15. In his new position he will deal with the unitization of federal lands.

Clifford R. Horn has resigned as assistant professor of petroleum engineering at Texas Technological College, Lubbock, to become an engineer in the production department of Panhandle Eastern Pipe Line Co. Last summer he was senior engineer for the Texas Railroad Commission.

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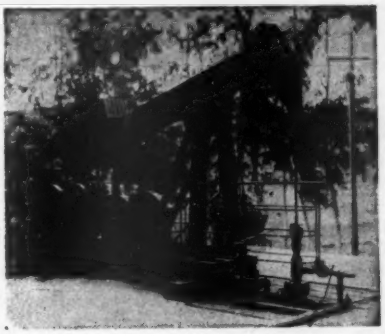

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Market Developments

East Coast

NEW YORK. — With gasoline demands being met adequately and with the season of heavy heating-oil consumption still ahead, the East Coast situation is comparatively easy for the first time in months. At the moment the principal problem is one of distribution within the district. The volume of products now being received is not only sufficient to meet requirements but is permitting substantial additions to storage.

Stocks of all products have been improving for the past 4 months with the exception of a short period in early August. Even with this consistent improvement, stocks at the last report were only 74.5 per cent of what they were a year ago. This unfavorable indication is offset entirely by the fact that deliveries to the district are now much higher than they were a year ago and will increase further before the season of heaviest demand.

This has reduced the supply problem to one of intradistrict distribution. This problem has become more acute with the increase in deliveries of both products and crude oil since it involves the distribution of a greater volume of products. East Coast refineries are running more crude than at any time in the past 18 months but manpower shortages, lack of some equipment and restrictions on the use of other transportation facilities have made orderly distribution of products from refineries as well as receiving terminals extremely difficult.

Gulf Coast

HOUSTON, Tex. — The downward trend of petroleum supplies on the Gulf Coast continued this week while refiners resorted to all sorts of ingenious methods to meet requests of customers.

Slight improvement was reported in the movement of residual fuel oil and plant operators were optimistic about averting any particular pressure on this product. They pointed out that the season of heavier consumption is at hand in the northeastern states and that heavier demands from industry are anticipated in the near future. Furthermore, certain adjustments in refinery operations authorized and urged by the Petroleum Administration for War are diminishing fuel production.

Natural gasoline is practically unavailable. New plants and expansion of existing manufacturing facilities capable of producing about 40,000 bbl. daily are projected or under construction in a program sponsored by PAW, mostly in District 3. The new facilities, however, will not start coming on stream for another 60 to 90 days and consequently are unavailable for meeting current shortages. Practically all war plants are actively seeking additional supplies of natural gasoline and allied products.

Many of the aviation-gasoline units under construction by the independent refiners on the Gulf Coast will be completed in December and part of the current operating technique is pointed at accumulation of charging stocks for these new facilities.

Mid-Continent

ANOTHER rise of natural-gasoline quotations and continued demand for motor gasoline in excess of readily available supplies featured the Mid-Continent market this week. Demand for motor gasoline was particularly strong from agricultural areas where consumption has been only mildly affected by the latest curtailment in civilian supplies.

Inquiries for light heating oils are becoming more important in market conditions although the general trend of movement continues toward storage. The time is near, however, when liquidation of stocks will reverse the trend and refiners anticipate a steady market for burning oils throughout the winter. Some improvement also was reported in the calls for residual fuel oils which have been only moderately active for several weeks.

Rural consumption of motor fuel, refiners point out, is the least likely of all civilian requirements to suffer much from the recent cut in coupon values. All branches of the Government are committed to a policy of removing all possible obstructions to agricultural operations. Consequently, rural consumption is in a favored category, and so far as analysts can foresee, this treament will prevail indefinitely.

Quotations for Oklahoma (Group 3) natural gasoline, 26-70 grade, advanced to 4.75 cents per gallon late last week, a rise of 0.25 cent. The most recent advance lifted the current market to within 0.125 cent per gallon of the OPA ceiling. Continued inability of manufacturers to supply all demand indicated that the ceiling quotations may prevail before the month ends.

Pacific Coast

LOS ANGELES, Calif.—PAW's directive instructing California refiners to restrict premium grades of gasoline to not more than 10 per cent by volume of the total civilian gasoline refined continues to be the chief subject of conversation because it will exert a very definite effect on refiners, marketers and resellers. Since rationing started, there has been a very decided tendency on the part of motorists to use premium grades of gasoline. The result is that for some time past California refiners and marketers have had a quality market and not a price market.

This directive is primarily interesting because of the OPA action reducing values of gasoline coupons. This was accomplished by reducing the coupon value from 4 gal. weekly to 3 gal., applicable to all A, B and C books. California rationing boards previously started rechecking B and C books to determine how much was actually needed for essential driving.

A recent check indicates quite definitely that there has been a decided decline in the number of passengers carried by automobiles. This is not so pronounced where defense workers drive long distances and for this reason the recheck now being made by ration boards should have a good chance of reducing the number of cars in use. The possibility of decreased gasoline sales has almost entirely eliminated spot sales and in the absence of bona fide sales prices have remained unchanged.

A.P.I. REFINERY REPORT

(Figures in thousands of barrels)

Week Ended October 2, 1943

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	151	2,289	450	898
Ind., Ill., Ky.	717	13,786	3,409	5,992
Okla., Kan., Mo.	355	6,291	1,562	2,264
Censored area*	2,092	30,555	17,983	19,481
Rockies	104	1,212	748	446
California	740	15,995	42,255	12,199
Total 10- 2-43	4,159	70,128	66,407	41,280
Total 9-25-43	4,156	70,024	66,659	40,328
Total 10- 3-42	3,902	78,080	79,303	45,727

*Reports combined on East Coast, Texas Gulf, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
October 2, 1943	234,643,000
September 25, 1943	†233,978,000
October 3, 1942	241,179,000

*Excludes unrefinable California stocks.
†Revised.

Refinery Prices

(Prices as of October 12, 1943)

Quotations are f.o.b. plant in cars and in cents per gallon except where otherwise noted. They are exclusive of the federal excise taxes of 1.5 cents a gallon on gasoline and 4.5 cents a gallon on lubricating oils, and do not include marine lighterage charges.

REFINERY GASOLINE

Octane (A.S.T.M.):	†80	74-76	70-72	68-70	63-66
Mid-Continent*	...	.....	6.000	...	5.625
Pennsylvania	...	6.750-7.000	.....	.....	.....
Gulf Coast	6.00-6.50	.....	§5.750-6.250	§5.750-6.250	§5.250-5.750
Northeast Coast	9.80	.....	9.2	9.2	.....
California	6.750-7.500	6.250-6.500	6.125-6.250	5.750-6.125	5.125-5.500

*Basis Group 3. †1939 C.F.R. (research method). §Unleaded.

KEROSENE AND NO. 1 FUEL OIL

Gravity:	46	45	42-44	41-43	38-40
Mid-Continent*	....	.....	4.500	4.375	.....
North Louisiana	.....	.....	.....	4.500-4.750	.....
Pennsylvania	6.250-6.625	6.125-6.250	.....	.....	.....
California	.....	.....	.....	4.500-5.500	4.250
Northeast Coast	.....	.....	.....	6.80	.....
Gulf Coast	.....	.....	.....	4.125	.....

*Basis Oklahoma Group 3

TRACTOR, DIESEL, AND BUNKER FUEL OIL

Specifications:	46-48° G.	24 D.I.	48-52 D.I.	58 & above	Diesel bunkers	Residual Bunker C†
Mid-Continent*	4.125	.....	.....	.....	.....	$0.80-1.27
California	.....	2.750-4.000	.....	.....	†1.35-1.45	0.85-1.00
Gulf Coast	.....	.....	4.000	4.125	1.45	0.85-1.27
Northeast Coast	.....	.....	.....	6.800	2.780	1.65-2.07
North Louisiana	.....	.....	.....	.....	.....	0.80-1.27

*Basis Oklahoma Group 3. †Gravity range. ‡Pacific Specification 200

FURNACE OIL, GAS OIL, FUEL OIL

	No. 2	No. 3	No. 5	No. 6
Mid-Continent*	3.625	3.500	$0.85	$0.80
Pennsylvania (West)	5.875-6.125	5.875-6.000	†5.250-5.500	.....
Northeast Coast	6.7	6.7	1.95	1.65
California	5.5	5.5	†1.10-1.25	‡1.10-1.15
Gulf Coast	3.750-3.875		1.35	0.85

*Basis Oklahoma Group 3. †36-40 gravity fuel. ‡Pacific Specification 300 §Pacific Specification 400.

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	4.750	5.700
North Texas	4.250	5.100
North Louisiana	4.375	5.250
California	4.875	5.500

LUBRICATING OILS

Bright and Steam Refined

OKLAHOMA (Group 3)—

200-210 D, 10-25	27.00
150-160 D, 0-10	23.00
120-125 D, 0-10	22.00
Steam refined:	
400 dark green (untreated)	9.00

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash)	
10 pour point	30.50
15 pour point	29.50
25 pour point	28.00
Steam refined:	
600	16.00
650	16.50
600 flash	17.50
650 flash	17.50

Neutral Oils

Vis at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

0-10 pour point:	
300-3	15.00
300-3	18.00
500-3	19.50
600-3	20.00

Note: Viscous neutrals, 10-25 pour, quoted 0.5 cent under 0-10 oils.

CALIFORNIA—

300-2½-3	7.00	7.75
400-3-4	7.25	8.00
600-3-4	8.75	11.00

Neutral Oils

Red oils:		
200-4-5	7.00	7.75
400-5-6	9.00	11.00
500-900, 5-6½	9.25	11.25

GULF COAST—

Pale oils:		
200-3	8.50	8.75
300-3	9.00	9.25
500-3½	9.75	10.00
750-3½	10.00	10.25
2,000-4	10.50	10.75
3,000-4	12.25	12.50

PENNSYLVANIA—

150 vis. at 70° F., 3 color, 400-405 flash:	
Zero pour point	37.50
10 pour point	36.50
15 pour point	35.50
25 pour point	30.00
200 vis. at 70° F., 3 color:	
Zero pour point	39.50
10 pour point	38.50
15 pour point	37.50
25 pour point	32.00

WAX

(Cents per pound)

OKLAHOMA (Group 3)—	
124-126 (A.m.p.) w.c. scale	4.250
PENNSYLVANIA (inland refineries)—	
122-124 (A.m.p.) w.c. scale	4.250
124-126 (A.m.p.) w.c. scale	4.250
NEW YORK—	
Wax in bags fully refined:	
130-132 (A.m.p.) wax	5.850
133-135 (A.m.p.) wax	6.150
Crude scale:	
124-126 (A.m.p.) w.s.	4.250
124-126 (A.m.p.) y.s.	4.250

TANK-WAGON PRICES IN 50 CITIES

(Gasoline prices based on regular grades, tax included, undivided dealer)

ATLANTIC AND NEW ENGLAND

(Socony-Vacuum Oil Co., Inc., and Atlantic Refining Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Baltimore, Md.	15.95	5.50	10.50
Boston, Mass.	14.90	4.50	10.10
Burlington, Vt.	16.90	5.50	10.20
Buffalo, N. Y.	16.30	5.50	10.90
Dover, Del.	16.70	5.50	12.30
Hartford, Conn.	15.60	4.50	10.00
Manchester, N. H.	17.30	5.50	12.10
Newark, N. J.	15.30	4.50	10.00
New York, N. Y.	16.10	5.50	10.10
Philadelphia, Pa.	16.20	5.50	11.90
Pittsburgh, Pa.	16.70	5.50	12.30
Portland, Me.	16.30	5.50	10.20
Providence, R. I.	15.00	4.50	9.90
Washington, D. C.	15.30	4.50	11.30
Average 14 cities	16.02	5.14	10.80

(All prices undivided dealer basis.)

CENTRAL

(Standard Oil Co. of Indiana, Standard Oil Co. of Ohio, Continental Oil Co. and Texas Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Chicago, Ill.	14.10	4.50	10.60
Cleveland	15.00	5.50	*9.00
Dallas, Tex.	13.00	5.50	7.00
Des Moines, Iowa	14.40	4.50	10.10
Detroit, Mich.	14.40	4.50	10.00
Fargo, N. D.	16.90	5.50	11.60
Huron, S. D.	16.30	5.50	11.00
Indianapolis, Ind.	15.60	5.50	10.10
Little Rock, Ark.	17.50	8.00	10.00
Milwaukee, Wis.	16.10	5.50	10.80
Minneapolis, Minn.	15.90	5.50	10.60
Omaha, Neb.	15.40	6.50	9.80
Tulsa, Okla.	16.50	7.00	8.50
Wichita, Kans.	13.30	4.50	8.70
Average 14 cities	17.46	5.57	9.84

*Includes 1-cent state tax.

SOUTHEASTERN

(Standard Oil Companies of New Jersey Kentucky, and Louisiana)

	Dealer tank wagon	Combined tax	Kero tank wag
Atlanta, Ga.	18.90	7.50	*11.50
Birmingham, Ala.	18.50	8.50	9.00
Charleston, S. C.	18.95	7.50	
Charleston, W. Va.	19.25	6.50	13.30
Charlotte, N. C.	20.10	7.50	11.30
Jacksonville, Fla.	18.90	8.50	9.50
Jackson, Miss.	17.50	7.50	†9.00
Louisville, Ky.	16.50	6.50	8.50
Memphis, Tenn.	17.90	8.50	10.50
New Orleans, La.	17.75	8.50	10.00
Norfolk, Va.	17.45	6.50	12.30
Average 11 cities	18.34	7.50	10.50

*Includes 1-cent state tax.
†Includes ½-cent state tax.

MIDWESTERN

(Continental Oil Co.)

	Dealer tank wagon	Combined tax	Kero tank wag
Albuquerque, N. M.	17.50	7.50	10.00
Boise, Idaho	20.10	6.50	16.50
Casper, Wyo.	17.00	5.50	12.00
Denver, Colo.	14.50	5.50	11.00
Helena, Mont.	17.00	6.50	13.00
Phoenix, Ariz.	18.50	6.50	12.50
Reno, Nev.	17.50	5.50	13.50
Salt Lake, Utah	18.50	6.50	14.50
Average 8 cities	17.58	6.25	12.88

PACIFIC COAST

(Standard Oil Co. of California)

	Dealer tank wagon	Combined tax	Kero tank wag
Portland, Ore.	17.00	6.50	13.50
San Francisco, Calif.	14.50	4.50	11.50
Seattle, Wash.	17.00	6.50	13.50
Average 3 cities	16.17	5.83	13.03
Average 50 cities	16.59	5.96	10.89

Equipment Progress

Zelt Elected Ranking Vice President, Oil Well Supply

Election of Albert R. Zelt of Oil City, Pa., as ranking vice president of the Oil Well Supply Co., U. S. Steel subsidiary, has been announced. Mr. Zelt's election occurred at a recent meeting of the board of directors of the company.

Formerly vice president of Oil Well Supply Co. in charge of manufacturing, Mr. Zelt's promotion is the second such announcement for the concern in recent weeks.

Mr. Zelt, 43 years old, was born at Washington, Pa. He attended grade school and high school in that city, and was graduated from Carnegie Institute of Technology in industrial engineering and mechanical engineering in 1923.

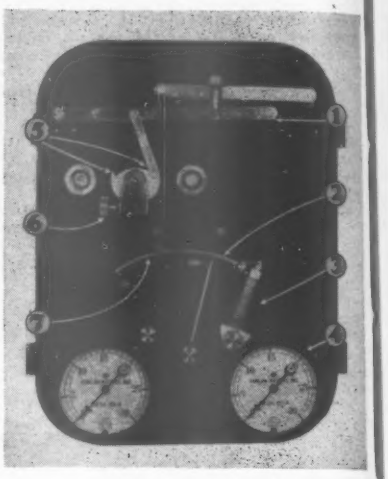
In 1931 he became manager of the service department of Oil Well Supply Co. with headquarters at Oil City, Pa. Shortly thereafter he was made works manager, and in 1941 was elected vice president in charge of manufacturing.

He is married and has two children, a boy of 15 and a girl of 11. He will make his future home at Dallas, Tex., headquarters of the company. Mr. Zelt is chairman of the rotary drilling machinery manufacturers' committee of the American Petroleum Institute.

Hanlon-Waters Announce Level Control Pilot

The new Hanlon-Walters Type 1410 level control pilot is especially designed to meet requirements for a level control pilot having a very wide "throttling range"—exact in its relation to the specific gravity of the liquids handled in the system. Wide throttling-range settings are most important for even-flow characteristics where surge impulse elimination raises efficiency and makes for better control of the system. "Snap action" settings are easily made without additional parts or special tools, if "on-off" action of control valve is desired.

Features of the new instrument especially recommend its use in the refining, chemical, synthetic, gasoline recycling and power industries. These are: (1) Specific gravity index scale setting from 0.10 to 2.0. (2) Wide throttling range adjustment from zero



to 300 per cent setting in exact relation to specific gravity setting. (3) Long-life bellows, operating throttle arm. (4) Straight-line pilot characteristic of pressure output to diaphragm versus level variation. (5) Simplified reversibility. (6) Adjustment for height of level control. (7) Snap-action settings on pilot without use of any additional parts or special tools. Complete information on the new H-W Type 1410 level control pilot may be obtained from the manufacturer, Hanlon-Waters, Inc., Tulsa.

Classified Advertising

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LEASES ROYALTIES

PRODUCING OR NONPRODUCING

Texas, New Mexico, Oklahoma.

Louisiana and Illinois.

10 Years' Experience

Inquiries Invited.

B. D BUCKLEY

60 Broadview Drive, Clayton

St. Louis, Mo.

SOUTHERN Georgia Leases, new play, 5 year, commercial, no rental. Write or wire. Dan Dillon, 427 West 30th St., Houston, Tex.

FOR SALE: Oil and gas leases and producing leases with offsets to drill. All in shallow territory. W. P. Harley, Bowling Green, Ky.

NEW MEXICO
State Oil and Gas Leases

TWO DEEP TESTS UNDER WAY—one a 7,500 ft. test; the other a 6,000 ft. test, 40 acres and multiples thereof for sale in the HoT SPoT. Write for information. HARRY S. WRIGHT, New Mexico State Lessee, Farmington, New Mexico.

LEASES AND DRILLING BLOCK

LEASES more active in many counties. Worth investigating for possible 100 for one profits up ahead of drilling. References. E. M. ADAMS, MARSHALL, TEXAS.

FOR SALE: Large oil and gas lease of 17,671 acres located W. Va. Practically proven for gas, ready market. J. H. Harmon, 235 Sturges Ave., Mansfield, Ohio.

DEALERS, Oil and Gas Leases: Get in touch with us for leases inside drilling blocks in Kentucky at once. Prices right, real oil play in the making. Dobbs Oil & Gas Co., 504 Wilson Bldg., Dallas, Texas.

DEALERS, oil and gas leases. Will sell half interest in three blocks of 1500 acres each, central west Texas county, strawn sand test. Have rig on ground ready to go. P. H. Gunther, 4419 Bowser Street, Dallas, Tex.

MISSISSIPPI

The coming new oil state. Buying orders given prompt attention. M. Lerew, 602 Standard Life Bldg., Jackson, Mississippi.

RANCHES AND FARM LANDS

304 ACRES, White River Valley farm, fine improvements, 9-room modern house, natural gas and electricity. Includes smoke house and brick fruit house, built-ins. Two tenant houses, 1—5 rooms and 1—4 rooms. 4 large barns. All buildings well constructed. 2 small barns at tenant houses, 2 chicken houses, electricity and running water in same. 1 rock potta house, 1,000-bushel capacity. Brick garage, 2 electric water systems. Over $60,000 improvements on this property. 152 acres in cultivation. Balance in pasture with creek and White River through pasture, fine grass. Cane brakes, will winter 75 head of cattle. 6 fine wells of water on place. Price $25,000. Part terms can be arranged. Located 10 miles from Fayetteville. New black tops. Highway 16 runs to door. Have about 100 head beef cattle and hogs, fine stock, white face. Buyer having preference to stock, tractors, all equipment if wanted. John A. Sargent. Elkins, Ark.

LEGAL BLANKS

OIL FIELD LEGAL BLANKS

Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 219 East Third St., Tulsa, Okla.

FINANCING

CAPITAL SEEKERS—Interested in raising $25,000 or more for a legitimate project should write to AMSTER LEONARD, Fox Theater Bldg., Detroit 1, Mich.

Classified Advertising

EQUIPMENT FOR SALE

CONSTRUCTION Equipment For Sale Eighty-five per cent of new cost. Factory rebuilt.

2—TA-40 wide gage International Tractors equipped with Trackson Pipe-layers.
2—R-5 wide gage, wide track Caterpillars equipped with Cardwell Pipe-Layers.
1—Model D Buckeye Back-Filler.
3 TD-18 International Tractors wide gage equipped with Bucyrus Erie Hydraulic Angle Dozer.
1—Caterpillar 40—Gas.
1—Caterpillar 50—Gas.
1—D-6 Tractor.
1—D-8 Caterpillar equipped with Trackson Pipe-Layer.
1—D-7 New Styler Caterpillar equipped with Trackson Pipe-Layer.
1—R-4 Caterpillar equipped with Trackson combination Pipe-Layer and Angle Dozer.
1—Model 33 Buckeye Ditching Machine Wheel type equipped with 21-inch bucket now. Has extra set 14-inch buckets. Will cut up to 33½-inch width.
1—Model 13-A Buckeye Ditching Machine Wheel type equipped with 14-inch bucket. Has extra set of 10-inch buckets.
1—R-5 wide gage Caterpillar Tractor equipped with La Plante Choate Hydraulic Angle Dozer.
1—Chicago Pneumatic Air Compressor. 105 feet. 2 Stage.
7—500 gallons Standard Paint Pots.

All this equipment in first-class condition. Available at once. For information rearding the above described equipment please refer to M. L. Heard or H. V. Bell 504 First Nat'l. Bank Bldg., Hamilton, Ohio.

FOR SALE—Complete slim hole rotary outfit, 85' Portable Derrick, three new Allis-Chalmers L-90 engines, 3,000' of 4½" drill pipe, and O.W.S. oil bath rotary table, all in A#1 condition. Located Oklahoma City, Okla. Thos. Whelan, 2612 First Natl. Bldg., Oklahoma City, Okla.

FOR SALE at our El Dorado, Kansas, warehouse: 50,000 feet of 2" used threaded and plain-end pipe, $35.00 per net ton. Cities Service Oil Co., Patridge, Bartlesville, Okla.

1—Hollow Spindle Attachment for Engine Lathe, 9" bore. $450.00.
1—Brauer Shaper—Mill.
(Milling Attachment for Shaper) $250.00.
BIG FOUR MACHINE & SUPPLY CO.
Box 256 Clay City, Illinois

FOR SALE: Approximately 3000' of 3½" 30' Drill Pipe with A.P.I. Full Hole Tool Joints. Melton Machinery & Supply Co., Seminole, Oklahoma.

K-TYPE Star Drilling Machine, extra good International Power, truck and trailer mounted, complete with tools for 12" to 6" holes. Glen Seaborn, Osawatomie, Kansas.

PUMPING UNITS, Reda electric; one rated 3000 bbl. per day, 2700 foot lift; one 1000 bbl. 6000 foot lift; one 500 bbl. 5000 feet. Complete units in good condition; others smaller. Write your needs. P.O. Box 2094, Tulsa, Okla.

FOR SALE: Streamlined super model Wilson pulling machine, with all enclosed streamlined guards, oil bath chains, S.R.K. 110 HP motor, 7" x 8" x 50' pole, with cross head sheaves, fire proof ignition with water cooled manifold, gasoline or natural gas carburetors, nothing left off. This machine would be suitable for most any field. Mounted on D.S. 40 International truck with all new rubber, all in excellent mechanical condition. Prefer to sell machine without truck, but will sell together. Will sell machine and tools or machine by self. Contact W. H. Bass at Fairfield, Illinois. Phone 292-W.

FOR SALE: 1—44 Super Star drilling machine, in good working condition; powered with 15-30 McCormick-Deering tractor, collapsible steel mast, 2 sheave crown. Write or call, Phil Wilbur, Pace Bldg., Duncan, Okla.

EQUIPMENT FOR SALE

WE offer at our Okmulgee, Okla., refinery the following:

9—Riveted Horizontal Steel Tanks, size 5'6" x 25' to 8' x 30'.
20—Small Vertical Riveted, suitable for production tanks.
5—4' x 20' Vertical Riveted Scrubber Tanks. Would make gun barrel or run-down tanks.
3—Small Scrubber Tanks, used in tail gas plant.
4—5' and 6' x 30' Vapor Towers.
4—Badger Towers.
5—10' x 30' Crude Stills.
1—12' x 32' Crude Still.
5—14' x 32' Crude Stills.
1—Green Fuel Economizer.

Patridge, Cities Service Oil Co., Bartlesville, Okla.

LARGE Sullivan Core Drill. Also adaptable to comparatively deep slim hole drilling. Not on truck. Some accessories. Box B-814, The Oil and Gas Journal, Tulsa, Okla.

ELECTRIC POWERED ROTARY DRILLING RIG

Complete, in good operating condition; just off 7,460' Oklahoma well. 2—300-h.p. Sterling gas/butane engines with Marley cooling tower, driving 2 Westinghouse D.C. generators; EMSCO H46 draw works and 25½" roller bearing table, driven by 150/300 h.p. Westinghouse motor through Link Belt speed reducer; 7¼ x 18 Wilson Synder pump, driven by 200-h.p. Westinghouse motor. Exciter, cooling fans and motors, wiring, switchboard. With or without 7,000' 3½" OD drill pipe, excellent condition; 6,500' 4½" OD drill pipe, fair condition. At Seminole, Okla. PIONEER DRILLING COMPANY, 738 Kennedy Bldg., Tulsa, Okla.

FOR SALE: At Barnsdall Okla., approximately 100 Type R Wico Igniters. Take all "as is," $1.00 each. Patridge, Cities Service Oil Co., Bartlesville, Okla.

FOR SALE: Near Arkansas City, Kans., 1—25 H.P. Ohio Single Cylinder Gas Engine. $150.00. Patridge, Cities Service Oil Co., Bartlesville, Okla.

FOR SALE: In Kansas 1 #10 Adams Leaning Wheel Grader. Steel wheels and tractor hitch. $650.00. Patridge, Cities Service Oil Co., Bartlesville, Okla.

FOR SALE: Refinery equipment. Hi-pressure steel valves and heavy 12" steel pipe, plain ends. List on request. HARVEY BROTHERS, Parkdale, Colo.

ATTENTION Reda Pump Users: 6625' Reda Cable, exceptionally good condition. Leonard Smith Co., 1526 N.E. 19th St. Phone 5-0841, Oklahoma City, Okla.

FOR SALE: 20,000' #2, 3 conductor, 1000 volt, armored Electric Transmission Cable. Repaired and Tested. Immediate Shipment. Leonard Smith Co., 1526 N.E. 19th St. Phone 5-0841, Oklahoma City, Okla.

FOR SALE: 1—84' angle iron derrick with crown block. $300.00. Melton Machinery & Supply Co., Seminole, Okla.

FOR SALE

Refinery, 750 Barrels Crude Capacity. Includes Pipe Still, Batch Still. Oil to Oil Heat Exchangers, 24" x 65' Fractionating Tower, Condensers. Pumps, Control Houses, Cooling Towers, Boilers, Piping and Tanks. All completely renovated, and boilers retubed. Located near railroad switch and easy to dismantle. Terms Cash.

THE JEANITE CORPORATION
8650 Rheem Ave., South Gate, Calif.

EQUIPMENT FOR SALE

1—Complete Model R Cardwell Unit equipped with D13000 Caterpillar engine.
2—D-17000 Caterpillar Diesel Engines.
2—200 HP. Atlas Imperial Diesel Engines.
2—300 HP. Atlas Imperial Diesel Engines.
1—190 HP. Cooper Bessemer Diesel Engine.
1—5 HP. Atlas Diesel Engine.
2—Diesel Electric Drilling Power Ends.
Various sizes A.C. Motors.

All the above completely rebuilt and modern in every respect. New Bearings of all makes. Big assortment of "V" sheaves, all D Section.

K. S. RICHARDS
P. O. Box 443 Fort Worth 1, Tex
Phone 3-5600

FOR SALE: One drop steam hammer, 600 pounds, same as new $300.00. J. F. Baker, Box 468, Breckenridge, Texas.

FOR SALE: 3712' of 2" seamless tubing and string of ¾" rods. Melton Machinery & Supply Co., Seminole, Oklahoma.

FOR SALE: 1 rebuilt Star Spudder, 58' steel mast made of 10" casing; twin Ford V-8 power unit; Koehler light plant; complete with water pump and tank, drilling line, sand line, everything needed for drilling from 15" to 6". In first class condition. Just completed well, depth 2821'. Outfit located Cowley County, Kansas. Price $6,500. Reply Box B-831, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

20,000 ft. 2½" Standard black, reconditioned pipe, T & C.

30,000 ft. 3" O.D. Genuine wrought iron tubes, plain and reconditioned.

7,000 ft. 8" cast iron flanged pipe, used.

1,500 tons re-usable structural steel.

500—8" Rolla grip couplings.

SONKEN-GALAMBA CORP.
Kansas City (10), Kansas

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Glen E. Thompson
P.O. Box 647 Tele. 837 Longview, Texas

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TEXAS COUNTY SURVEY MAPS

We have only a limited number. No re-print for the duration. While they last, only $1.00 each; five maps, any Texas county or counties, only $3.50. 17x22 inches, ordinary map paper. Write us your map requirements, any field, any county, any state, anywhere; if we haven't it, maybe we can find it for you.

TEXAS LAW BOOK CO.
P.O. Box 1392, Dallas, Texas.

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Armstrong Machine Works 101
Bantam Bearings Div., The Torrington Co. 4
Bethlehem Supply Company 1
Bigelow-Liptak Corp. 2
Brown Instrument Company, The 10
Bucyrus-Erie Co. 46
Cable, Jo H. 99
Cameron Iron Works, Inc. 79
Cardox Corp. 9
Century Electric Company 72
Chapman Valve Mfg. Co., The 30
Cities Service Oil Co. 97
Clark Brothers Company, Inc. 7
Classified Advertising 117-118-119
Cleveland Trencher Company, The 85
Coppus Engineering Corp. 9
Crane Co. 5
Cummins Engine Co. 15
Curtin & Co., Inc., W. H. 109
Dayton Rubber Mfg. Co., The 83
Dean Brothers Pumps, Inc. 95
Dresser Mfg. Co., The 21
Engineers & Fabricators, Inc. 93
Filtrol Corporation 95
First National Bank & Trust Co. of Tulsa, The 98
Fisher Governor Company 17
Flanders Construction Co. 108
Fluid Packed Pump Co. 14
Fraser-Brace Engineering Co., Inc. 82
Gaike Corporation 96
General American Transportation Corporation—Terminal Division 89
General Electric Company 65
Globe Steel Tubes Company 45
Gott Mfg. Co., H. P. 95
Graver Tank & Mfg. Co., Inc. 76
Halliburton Oil Well Cementing Co. ..... Inside Front Cover
Hanlon-Buchanan, Inc. 24
Hanlon-Waters, Inc. 88
Harnischfeger Corporation 11
Harrisburg Steel Corporation 80
Hazard Wire Rope Division of American Chain & Cable Co., Inc. ..... Inside Back Cover
Hills-McCanna Co. 101
Houdry Process Corp. 18
Hudson Engineering Corp. 87
Hughes Tool Co. ..... Back Cover
Jensen Brothers Manufacturing Co. 113
Johns-Manville 75
Kellett Aircraft Corp. 66
Kellogg Company, The M. W. 103
Lane-Wells Company 40
McDermott, Inc., Tom P. 92
McDonald Co., B. F. 80
Mayfair Hotel 101
National Airoil Burner Co., Inc. 97
National Supply Co., The 58-59
Oil Well Improvements Co. 111
Petroleum Rectifying Company 57
Pittsburgh Plate Glass Co., Columbia Chemical Div. 55
Powell Co., The Wm. 19
Price Co., H. C. 85
Rector Well Equipment Co. 109
Reed Roller Bit Company 48
Republic Flow Meters Co. 20
Rollway Bearing Co., Inc. 8
Schundler & Co., Inc., F. E. 113
Seismograph Service Corp. 52A
Sharman and Allen 85
SKF Industries, Inc. 12
Socony-Vacuum Oil Co., Inc. 6
Stoody Co. 81-84-108
Sturtevant Company, B. F. 74
Timken-Detroit Axle Co., The 61
Timken Roller Bearing Company ..... Front Cover
Union Wire Rope Corporation 13
United States Rubber Company 62
United Steel Companies Limited, The 16
Universal Oil Products Co. 39
Van der Horst Corp. of America 71
Viking Pump Co. 82
Vulcan Steel Tank Corp. 113
Wyatt Metal & Boiler Works 52D
Youngstown Sheet & Tube Co., The 37
Zink Co., John 113

Journalisms:

THE Project Five pipe line from El Dorado to Helena, Ark., utilized available equipment from existing crude-oil lines for construction of a system normally handling between 46,000 and 56,000 bbl. of refined products. It is operated without the use of an inhibitor in the fluid. Corrosion is combated by special care taken in eliminating water from gasoline before it enters the line. A feature of the line is the type of scale trap installed for removing suspended matter from the fluid instead of the filter units or "hay tanks" which are found on most pipe lines. Equipment and operation of the Project Five line will be described in a staff article prepared after a visit to the system.

THE fact that the quantity of new equipment available in wartime is scant is well known, but less attention is paid to the fact that the quality is sometimes poor. Thus, when replacements are possible, they frequently cause more trouble than the effort to keep old equipment in condition for use. How this has affected the operations of one major company and the steps it is taking to minimize the difficulties will be related in an article by M. Lyle Cashion, Gulf Oil Corp., in next week's Engineering and Operating Section.

ALONG similar lines, there will also appear an article showing how Lion Oil & Refining Co. operates an extensive salvage and repair system, ranging from reconditioning nipples to rebuilding wrecked tank cars.

THE Wagner series on Cracking Technology continues to arouse great interest among refinery engineers and operators. Like all Journal series, each installment is a separate and complete article dealing with a single phase of the subject. Next week's article on reforming naphtha will prove of particular interest.

CALENDAR

October

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, petroleum division, fall meeting, Ambassador Hotel, Los Angeles, Calif., October 21-22.

NATIONAL STRIPPER WELL ASSOCIATION, annual meeting, Blackstone Hotel, Fort Worth, Tex., October 25.

INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA annual meeting. Fort Worth, Tex., October 25-27.

PETROLEUM DIVISION NATIONAL ASSOCIATION OF CREDIT MEN, annual conference, St. Louis, Mo., October 25-27.

AMERICAN GAS ASSOCIATION twenty-fifth annual meeting. Jefferson Hotel, St. Louis, Mo., October 26, 27 and 28.

MID-CONTINENT OIL AND GAS ASSOCIATION, Louisiana - Arkansas division, Slattery Building, Shreveport, La., October 29.

November

SOCIETY OF AUTOMOTIVE ENGINEERS, Mayo Hotel, Tulsa, November 4-5.

AMERICAN PETROLEUM INSTITUTE, twenty-fourth annual meeting Palmer House, Chicago, Ill., November 8-11.

December

NINETEENTH EXPOSITION OF CHEMICAL INDUSTRIES, Madison Square Garden, New York, December 6-11.